

# Installation and maintenance instructions

Gas condensing boiler



6 720 618 565-00-1RS

## Logano plus GB402

For contractors

Read carefully prior  
to installation and  
maintenance.

6 720 642 914 (04/2010) GB

**Buderus**

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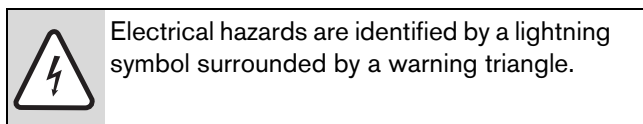
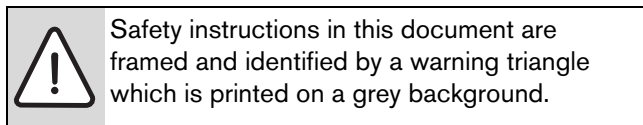
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# 1 Explanation of symbols and safety information

## 1.1 Explanation of symbols

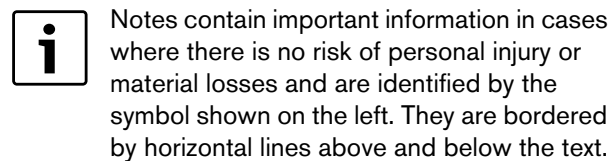
### Warning symbols



Signal words indicate the seriousness of the hazard in terms of the consequences of not following the safety instructions.

- **NOTICE** indicates possible damage to property or equipment, but where there is no risk of injury.
- **CAUTION** indicates possible injury.
- **WARNING** indicates possible severe injury.
- **DANGER** indicates possible risk to life.

### Important information



### Additional symbols

Symbol	Meaning
▶	a step in an action sequence
→	a reference to a related part in the document or to other related documents
•	a list entry
–	a list entry (second level)

Tab. 1

## 1.2 Safety precautions

### If you smell gas

- ▶ Close the gas tap.
- ▶ Open windows and doors.
- ▶ Never operate electrical switches, including telephones, plugs or doorbells.
- ▶ Extinguish all naked flames. Do not smoke! Never use any lighters or sources of ignition of any kind.
- ▶ Warn all occupants of the building, but do not ring doorbells.
- ▶ If you can actually hear gas escaping, leave the building immediately. Prevent others from entering and notify the police and fire services **from outside** the building.
- ▶ **From outside the building**, call your gas supply utility and approved contractor.

### If you smell flue gas

- ▶ Switch off the boiler (→ page 39).
- ▶ Open windows and doors.
- ▶ Notify an authorised contractor.

### Risk of poisoning. An insufficient supply of air can result in dangerous escape of flue gas.

- ▶ Never block ventilation and extract air apertures or reduce their size.
- ▶ The boiler must not be operated, unless you immediately remedy the fault.
- ▶ Inform the system operator in writing of the problem and associated risk.

### Risk from escaping gases

- ▶ Ensure that the flue pipes and seals are not damaged.
- ▶ Ensure that the boiler is not equipped with a ventilation air damper or a thermostatic shut-off damper downstream of the flue connection.

### Risk of explosion of flammable gases

- ▶ Any work on components in contact with gas may only be carried out by an approved contractor.

### Danger posed by explosive and easily flammable materials

- ▶ Never use or store combustible materials (paper, curtains, clothing, thinners, paints, etc.) in the vicinity of the boiler.

**Risk of electric shock when the boiler is open**

- ▶ Prior to opening the boiler: Disconnect the power across all poles and secure against unintentional reconnection.
- ▶ It is not enough to switch off the control unit.

**Danger due to short circuits**

To prevent short circuits:

- ▶ Only use original Buderus cables.

**Positioning and adjustment**

- ▶ Correct and proper installation and adjustment of the burner and the control unit are the fundamental requirements for safe and economical operation of the boiler.
- ▶ Only permit an authorised contractor to install the boiler.
- ▶ Never change any parts in contact with flue gas.
- ▶ Work on components in contact with gas must only be carried out by certified gas fitters.
- ▶ Electrical work must only be carried out by qualified electricians.
- ▶ Never operate the boiler in rooms that are permanently occupied.
- ▶ Do not cover or reduce the size of ventilation openings in doors, windows and walls. If draught-proof windows are fitted, ensure there is an adequate supply of combustion air.
- ▶ **Never shut off safety valves.**  
Water may be expelled from the heating circuit and DHW pipework during heat-up.

**Risk of damage due to operator error**

Operator errors can result in injury and damage to property.

- ▶ Ensure that children never operate this appliance unsupervised or play with it.
- ▶ Ensure that only personnel who can operate this appliance correctly have access to it.

**Instructing the customer**

- ▶ Explain to the customer how the boiler works and how to operate it.
- ▶ The operator is responsible for the safety and environmental compatibility of the heating system (Federal Immissions Act [Germany]).
- ▶ Advise customers that they may not carry out any modifications or repairs.
- ▶ Only authorised contractors may carry out maintenance and repair work.
- ▶ Use only original spare parts.
- ▶ Any other combinations, accessories and wearing parts may only be used if they are specifically designed for the application and impair neither the performance characteristics nor the safety requirements.

## 2 Information about the appliance

### 2.1 EU Declaration of Conformity

The design and operation of this product conform to the European Directives and the supplementary national requirements. Its conformity is demonstrated by the CE designation. You can call up the Declaration of Conformity for this product on the internet at [www.buderus.de/konfo](http://www.buderus.de/konfo) or request a copy from your local Buderus sales office.

### 2.2 Intended use

The Logano plus GB402 is designed for conventional use as a gas condensing boiler for DHW and central heating.

Only gas supplied by the public gas supply utility can be used.

Observe the details on the type plate and the specification (→ Chapter 2.7) to ensure correct use.

### 2.3 Regarding these instructions

These installation and maintenance instructions contain important information for the safe and appropriate installation, commissioning and servicing of this gas condensing boiler.

These installation and maintenance instructions as well as the service instructions are designed for contractors who, through their technical training and experience, are knowledgeable in handling heating systems and gas installations.

The following documents are available for the Logano plus GB402:

- Operating instructions
- Operating instructions, MC10 control unit
- Installation and maintenance instructions
- Operator's log
- Technical guide

The above documents are also available for downloading via the Buderus website.

Please contact us with suggestions for improvement or if you notice any errors. For contact addresses and our internet address, see the back cover of this document.

### 2.4 Tools, materials and equipment

For boiler installation and maintenance you will need the following:

- Standard tools used for central heating, gas and water installation, plus set of a metric open-ended spanners and Allen keys.
- The RC35 programming unit as a monitoring device for commissioning, inspecting and servicing the boiler.



A PC with Buderus Logamatic ECO-Soft4000/EMS and a service key can also be used as a monitoring device.

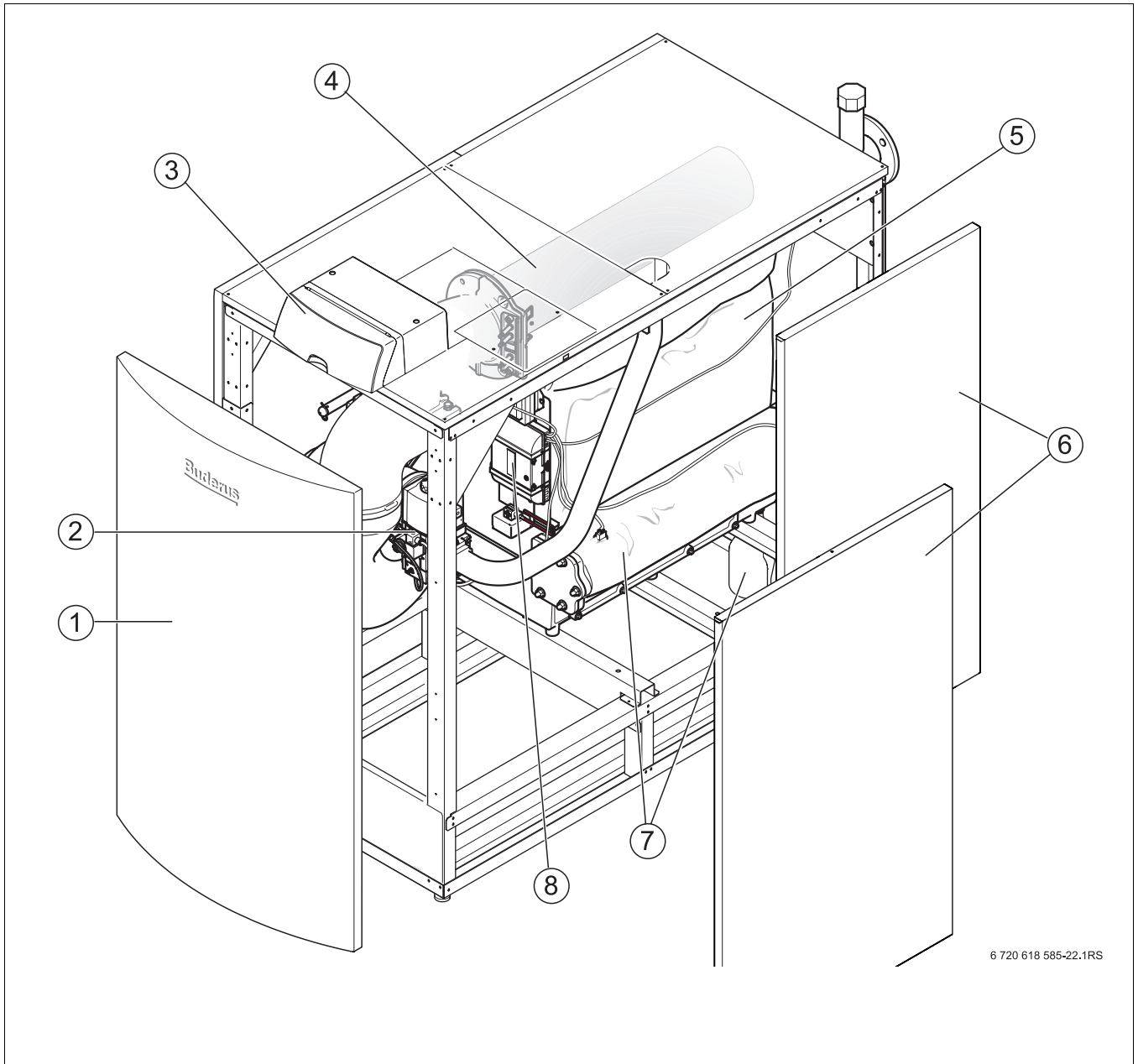
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The following may also prove useful:

- 5 pipes (approx. R 1 1/4 ", approx. 900 mm long) as supports on which to roll the boiler into place
- Cleaning panels and/or chemical cleaning agent for wet cleaning (available as accessories)

## 2.5 Product description

The Logano plus GB402 is a gas condensing boiler with an aluminium heat exchanger.



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Fig. 1 Logano plus GB402 - main components

- 1 Boiler front panel
- 2 Gas valve
- 3 Control unit (MC10 and BC10)
- 4 Gas burner (burner rod)
- 5 Boiler block with thermal insulation
- 6 Boiler casing
- 7 Condensate tray and siphon
- 8 Burner control unit

The main components of the Logano plus GB402 (→ Fig. 1) are:

- Control unit
- Appliance frame and casing
- Boiler block with thermal insulation
- Gas burner

The control unit monitors and controls all electrical boiler components.

The boiler block transfers the heat generated by the burner to the heating water. The thermal insulation reduces the radiation and standby losses.

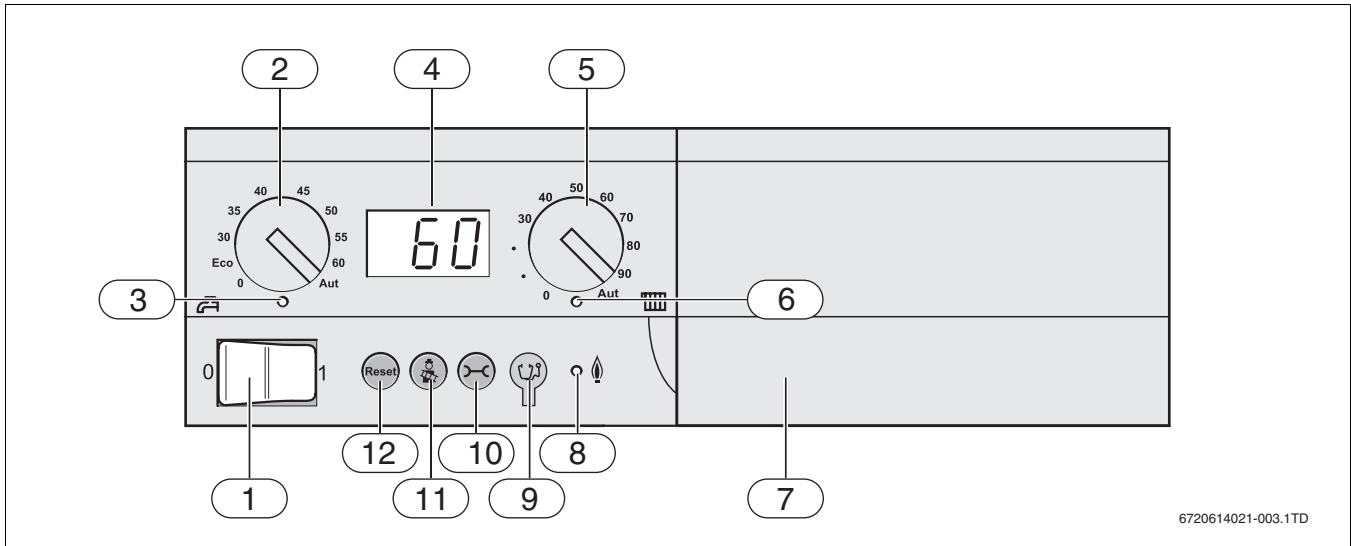


Fig. 2 Controls on the Logamatic BC10 base controller

- 1 "ON/OFF" switch
- 2 Rotary selector for set DHW temperature
- 3 "DHW heating" LED
- 4 Status display
- 5 Rotary selector for maximum boiler temperature
- 6 "Heat demand" LED
- 7 Base plate with a slot for a programming unit, e.g. RC35 (behind the fascia)
- 8 "Burner" (ON/OFF) LED
- 9 Connection socket for diagnostic plug
- 10 "Status display" key
- 11 "Flue gas test" key
- 12 "Reset" button

Logamatic BC10 base controller (→ Fig. 2).

The Logamatic BC10 base controller provides control over the standard functions of the heating system. It provides functions including the following:

- Switching the heating system ON and OFF
- DHW temperature default and maximum boiler water temperature in heating mode
- Status display

Fig. 2 provides an overview of the controls of the Logamatic BC10 base controller.

Programming units (such as the RC35\*) offer many additional functions for the convenient control of your heating system.

\* available separately



## 2.6 Standard delivery

The Logano plus GB402 is supplied as standard with a Logamatic BC10 base controller and the MC10 control unit in 3 separate packages.

- ▶ Upon receipt, check that all packaging is in perfect condition.
- ▶ Check the delivery for completeness.
- ▶ Dispose of packaging in an environmentally responsible manner.

Packing unit	Component	Packaging
1 (boiler)	Assembled boiler (excluding casing)	1 shrink-wrap package on a pallet
	Siphon	1 shrink-wrap package
	Adjustable feet	1 shrink-wrap package
	Boiler flue connection	1 carton
	Labelgas type conversion	1 shrink-wrap package
	Technical documentation	1 shrink-wrap package
2 (separate)	Casing	1 carton
3 (separate)	MC10 control unit (including BC10)	1 carton

Tab. 2 Standard delivery

### Accessories

Many individual accessories are available for this boiler. For details regarding suitable accessories, see the catalogue.

The following accessories are available from your local sales office:

- Safety valve or safety assembly
- Flue gas system
- Ventilation air system
- Programming unit, e.g. RC35
- Silencer
- Ventilation air adaptor (accessory for balanced flue operation)

## 2.7 Dimensions and specification

### 2.7.1 Logano plus GB402 dimensions

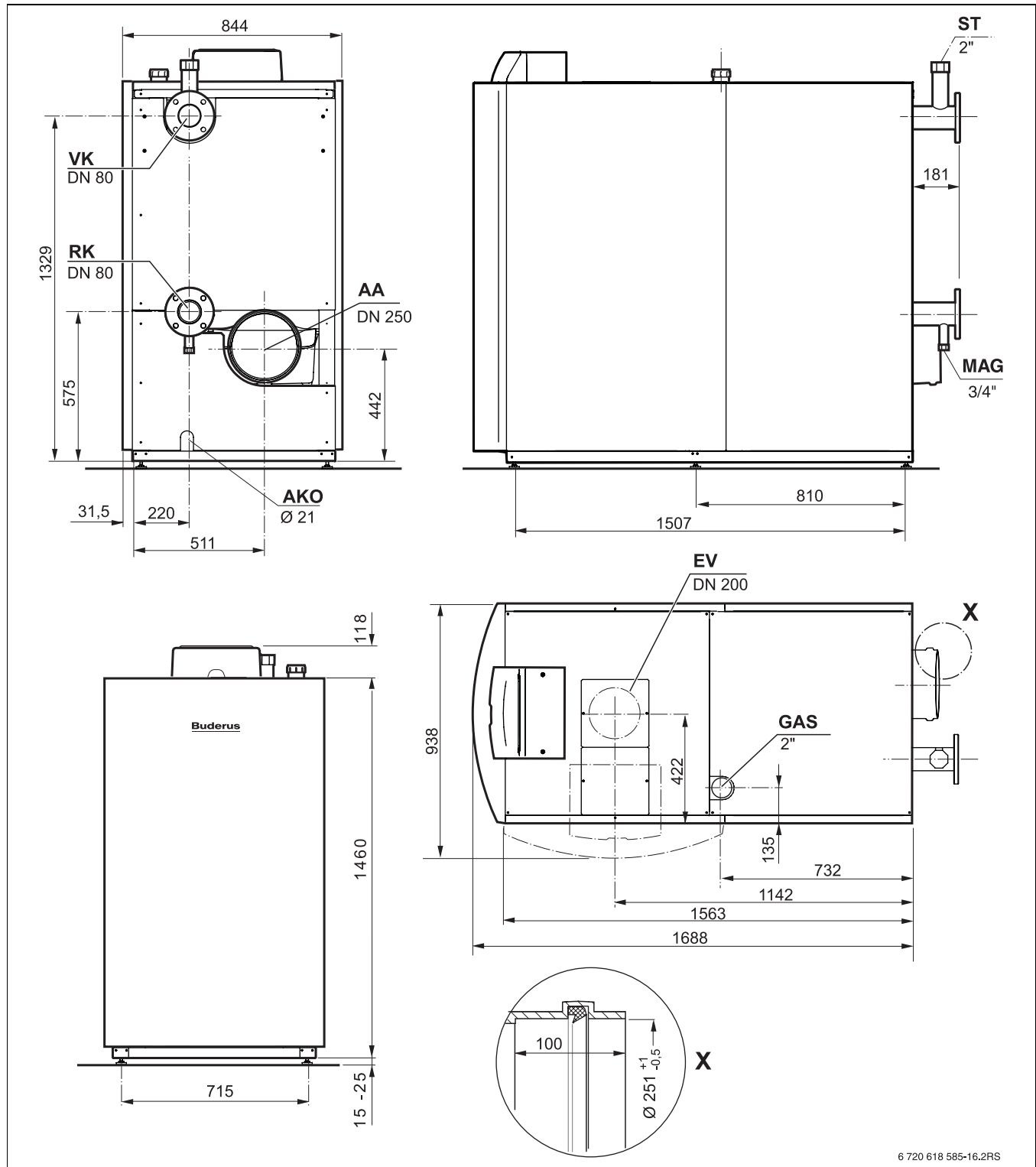


Fig. 3 Dimensions and connections for the Logano plus GB402 (dimensions in mm)

- |  |  |
|--|--|
| <b>AA</b> = Flue gas outlet  | <b>RK</b> = Boiler return                              |
| <b>AKO</b> = Condensate outlet   | <b>ST</b> = Safety valve or safety assembly connection |
| <b>EV</b> = Combustion air pipe inlet (balanced flue operation only)                         | <b>VK</b> = Boiler flow                                |
| <b>GAS</b> = Gas connection  |  |
| <b>MAG</b> = Optional connection for a diaphragm expansion vessel to protect a single boiler |  |

## 2.7.2 Specification

	Unit	Boiler size (output - no. of sections)					
		GB402-320 - 5	GB402-395 - 6	GB402-470 - 7	GB402-545 - 8	GB402-620 - 9	
Rated heat input	kW	61.0 – 304.8	75.2 – 376.2	89.5 – 447.6	103.8 – 519.0	118.0 – 590.0	
Rated output at 80/60 °C	kW	58.9 – 297.2	72.6 – 367.4	85.2 – 435.8	100.7 – 507.0	114.9 – 578.2	
Rated output at 50/30 °C	kW	66.7 – 320.0	80.5 – 395.0	95.6 – 468.2	113.0 – 545.0	127.6 – 621.4	
Boiler efficiency, maximum output, at 80/60 °C	%	97.5	97.6	97.6	97.7	98.0	
Boiler efficiency, maximum output, at 50/30 °C	%	105.1	105.0	104.6	105.0	105.3	
Seasonal efficiency [to DIN], heating curve 75/60 °C	%	106.0	106.3	106.6	106.3	106.4	
Seasonal efficiency [to DIN], heating curve 40/30 °C	%	109.6	109.4	109.7	109.3	110.4	
Standby heat loss at excess temperature 30/50 K	%	0.20/0.33	0.16/0.27	0.14/0.23	0.12/0.20	0.11/0.17	
<b>Heating water circuit</b>							
Boiler water capacity	l	47.3	53.3	59.3	65.3	75.3	
Pressure drop on the heating water side at $\Delta t$ 20 K	mbar	99	105	95	108	113	
Maximum flow temperature central heating/DHW mode	°C	30 – 85					
Safety limit/high limit safety cut-out	°C	100					
Maximum permissible operating pressure	bar	6					
<b>Pipework connections</b>							
Gas connection	Inches	2					
Heating water connection	DN/mm	80					
Condensate connection	Inches	¾ "					
<b>Flue gas values</b>							
Flue gas connection	mm	250					
Volume of condensate for natural gas G20, 40/30 °C	l/h	30.8	39.2	46.2	55.9	64.7	
Flue gas mass flow rate	Full load	g/s	142.4	174.5	207.1	240.6	271.9
	Partial load	g/s	28.7	36.8	40.6	48.0	53.2
Flue gas temperature 50/30 °C	Full load	°C	45	44	44	43	44
	Partial load	°C	30				
Flue gas temperature 80/60 °C	Full load	°C	65				
	Partial load	°C	57	58	58	58	58
CO <sub>2</sub> content, natural gas E/LL	Full load	%	9.1				
	Partial load	%	9.3				
Standard CO emissions factor	mg/kWh	20					
Standard NO <sub>x</sub> emissions factor	mg/kWh	40					
Residual draught, fan (flue gas and combustion air system)	Pa	100					
<b>Flue gas system</b>							
Type (according to DVGW regulations)		B <sub>23</sub> , B <sub>23P</sub> (open flue operation) C <sub>13</sub> , C <sub>33</sub> , C <sub>43</sub> , C <sub>53</sub> , C <sub>63</sub> , C <sub>83</sub> , C <sub>93</sub> (balanced flue operation)					
Type (Belgium and Netherlands)		B <sub>23</sub> , (open flue operation) C <sub>13</sub> , C <sub>33</sub> , C <sub>43</sub> , C <sub>53</sub> , C <sub>63</sub> , C <sub>83</sub> , C <sub>93</sub> (balanced flue operation)					
<b>Electrical data</b>							
Electrical IP rating	-	IPX0D					
Supply voltage/frequency	V/Hz	230/50					
Power consumption	Full load	W	395	449	487	588	734
	Partial load	W	40	45	42	45	49
Protection against electrocution		Safety category 1					
Maximum permissible appliance fuse rating	A	10					
<b>Appliance dimensions and weight</b>							
Handling dimensions width × depth × height	mm	781 x 1740 x 1542					
Weight (excl. casing)	kg	410	438	465	493	520	

Tab. 3 Specification

<b>Boiler size</b>	<b>Natural gas H (G20) Wobbe index 14.9 kWh/m<sup>3</sup> Gas throughput [m<sup>3</sup>/h]</b>	<b>Natural gas L (DE) Wobbe index 12.8 kWh/m<sup>3</sup> Gas throughput [m<sup>3</sup>/h]</b>	<b>Natural gas L (G25) (NL) Wobbe index 12.2 kWh/m<sup>3</sup> Gas throughput [m<sup>3</sup>/h]</b>
320 -5	32.3	34.3	37.6
395 -6	39.8	42.4	46.4
470 -7	47.4	50.4	55.2
545 -8	55.0	58.4	64.0
620 -9	62.5	66.5	72.8

Tab. 4 Gas throughput (relative to 15 °C gas temperature and 1013 mbar air pressure)

<b>Country</b>	<b>Mains supply pressure P [mbar]</b>	<b>Gas category</b>	<b>Gas type already set on the boiler, or corresponding gas type conversion kits supplied</b>	<b>Delivered set to the mains supply pressure in mbar <sup>1)</sup></b>
DE	20	I <sub>2ELL</sub>	G20/G25	20
AT, CH, SK	20	I <sub>2H</sub>	G20	20
ES, GB, IE, IT, PT, SI	20	I <sub>2H</sub>	G20	20
EE, DK, HR, NO, SE	20	I <sub>2H</sub>	G20	20
FR	20/25	I <sub>2ESi</sub>	G20	20
BE	20/25	I <sub>2E(R)B</sub>	G20	20
CZ	20	I <sub>2H</sub>	G20	20
LU	20	I <sub>2E</sub>	G20	20
NL	25	I <sub>2L</sub>	G25	25
PL	20	I <sub>2ELw</sub>	G20	20
HU	25	I <sub>2HS</sub>	G20	25
BA, BG, GR	20/50	II <sub>2H3B/P</sub>	G25	25
BY, CN, RO, RU, UA	20/50	II <sub>2H3P</sub>	G25	25

Tab. 5 Country-specific gas categories and supply pressures

1) The gas supply utility must guarantee the minimum and maximum pressures (acc. to national regulations for public gas supply).

## 3 Regulations

### 3.1 Standards, regulations and directives



Observe all standards and directives applicable to the installation and operation of this heating system in the country in which it is used.

Observe the details on the boiler type plate.

### 3.2 Notes on installation and operation

When installing and operating the heating system observe the following:

- local building regulations regarding the installation conditions
- local building regulations regarding ventilation and extract air systems and the chimney connection
- regulations regarding connection to the power supply
- technical rules of the gas supply utility regarding the connection of the gas burner to the public mains gas supply.
- regulations and standards regarding the safety equipment level of water-filled heating systems.

The following also applies in **Switzerland**:

The boilers have been tested and approved by the SVGW in accordance with the requirements of the Clean Air Regulation (LRV, Appendix 4) and the Fire Safety Regulations Guide from the VKF. During installation, observe the guidelines for installing and operating gas combustion equipment G3 d/f, the gas guidelines G1 from the SVGW, and local fire safety regulations in force within the canton.

In **Austria**, local building regulations and ÖVGW guideline G1/G2 (ÖVGW-TR gas and LPG) must be observed during installation. Conversion to LPG is not possible. The requirements of the national directive Article 15a B-VG, regarding emissions and efficiency, are fulfilled.

### 3.3 Duty to obtain a permit and provide notification

- ▶ The local gas supply utility must be notified of and approve the gas boiler installation.
- ▶ Please note that regional approvals may be required for the flue system and the connection of the condensate outlet to the public sewerage system.
- ▶ Prior to commencing installation, inform the local flue gas inspector [where appropriate] and water authority.

### 3.4 Heating water quality

As pure water cannot be used for the heat transfer, water quality is important. Poor water quality can damage heating systems due to scale formation and corrosion.



Water quality is an essential factor for increased efficiency, functional reliability, long service life and for maintaining the constant operational condition of a heating system.

- ▶ Record the values listed in the operator's log to verify the water quality.

### 3.5 Combustion air connection / flue connection

The installation room must be equipped with the required combustion air apertures.

For **open flue** operation, the following applies:

Provide combustion air apertures in accordance with the following table.

Gas condensing boiler	Aperture cross-section in cm <sup>2</sup>
GB402-320-5	> 690
GB402-395-6	> 850
GB402-470-7	> 990
GB402-545-8	> 1150
GB402-620-9	> 1290

Tab. 6 Combustion air apertures

For **balanced flue** operation, the following applies:

For ventilation of the installation room, there must be one upper and one lower aperture to the outside of at least 150 cm<sup>2</sup> or alternatively lines to the outside that feature equivalent cross-sections in terms of flow.

- ▶ Never position objects in front of these apertures. Keep the combustion air apertures free at all times.

### 3.6 Combustion air quality

- ▶ Keep the supply of combustion air free of corrosive substances (e.g. halogenated hydrocarbons that contain chlorine or fluorine compounds). This will help prevent corrosion.

### 3.7 Disposal

- ▶ All heating system components that have to be replaced should be disposed of in an environmentally responsible manner at an authorised disposal site.

## 4 Transporting the boiler



**CAUTION:** Risk of injury through carrying heavy loads.

- ▶ Only transport the boiler by means of a crane/hoist, forklift truck or transport rollers.



**DANGER:** Risk to life!

Falling loads can result in life-threatening injuries.

- ▶ Only transport the boiler by means of a crane/hoist, forklift truck or transport rollers.
- ▶ Only trained authorised personnel may undertake the handling (e.g. by forklift truck) or lifting by means of a crane/hoist.
- ▶ Observe safety instructions relating to the lifting of heavy loads (e.g. by means of a crane/hoist).
- ▶ Wear personal safety equipment (e.g. safety boots and protective gloves).
- ▶ Protect the boiler against slippage by means of a transport strap.



**NOTICE:** Boiler damage through impact.

The standard delivery of the boiler includes components that are susceptible to impact damage.

- ▶ Protect all components against impact influences when transporting the boiler.
- ▶ Observe the transport instructions on the packaging.

The boiler may be transported to the place of installation by crane/hoist, forklift truck or pallet truck. Where possible, transport the boiler to the installation location in its shipping packaging to protect it from contamination.

### 4.1 Transporting the boiler by crane/hoist

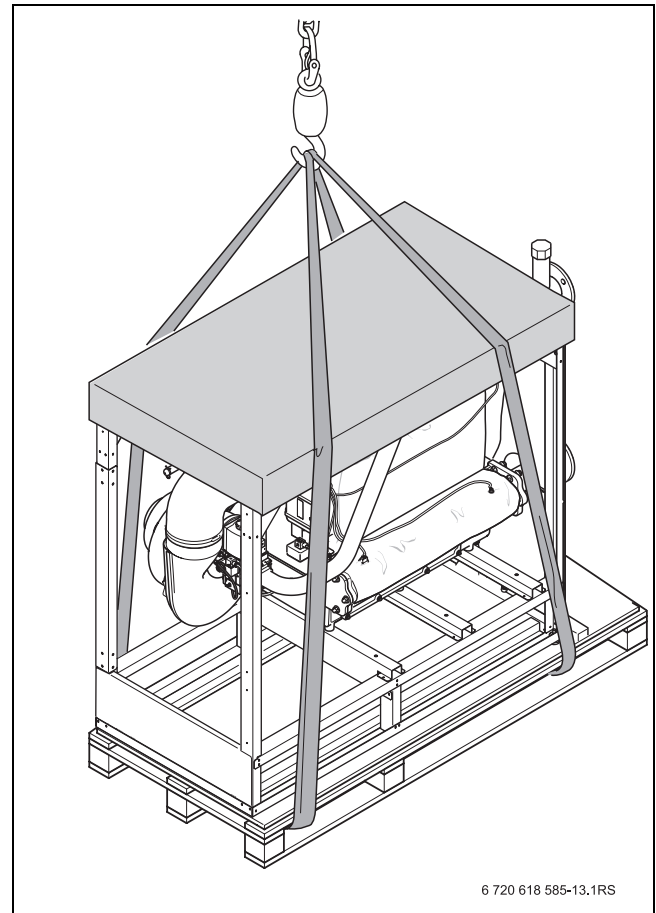


**NOTICE:** Boiler damage through means of transport.

Without the inverted carton, the boiler frame will deform through lifting it by crane/hoist.

- ▶ When transporting the boiler do not remove the inverted carton with internal wooden crate.

- ▶ Route the lifting gear (round slings) through the pallet.

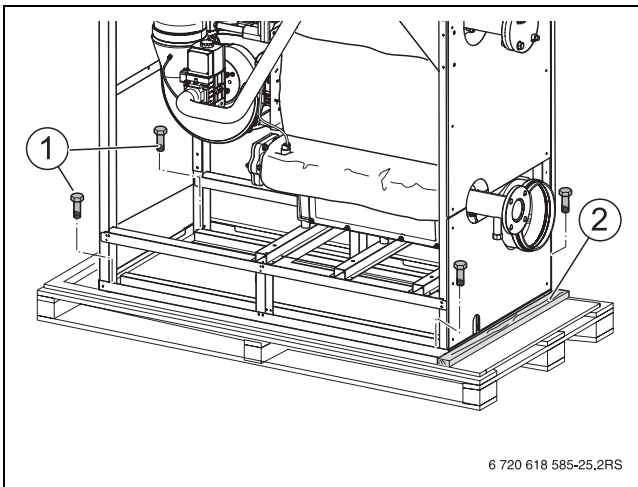


6 720 618 585-13.1RS

Fig. 4 Transporting the boiler on its pallet by crane/hoist

### 4.1.1 Lifting the boiler off the pallet

- ▶ Remove 4 safety screws [1].



6 720 618 585-25.2RS

Fig. 5 Separating the boiler from the pallet

- 1 Safety screws
- 2 Fixing bar



**NOTICE:** Boiler damage through impact.

The boiler is at risk of tipping over if it is pushed off the side of the pallet.

- ▶ Push the boiler off the pallet towards the burner or flue gas side. When pushing the boiler from the flue gas side, remove fixing bar [2].
- ▶ Prevent the boiler from coming down hard.

### 4.2 Transporting the boiler on rollers

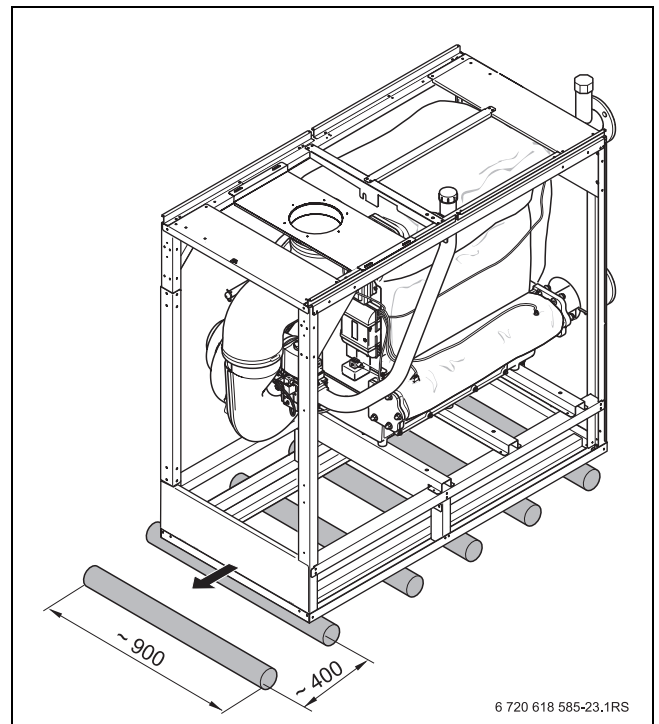
If the path to the boiler room is level, the boiler can also be rolled. For this, use at least 5 pipes of approx. 900 mm length (R 1 1/4 " diameter) as rolling supports.

- ▶ Position the pipes approx. 400 mm apart on the floor.
- ▶ Lift the boiler onto the pipe sections and carefully transport it to the installation room.



Commercially available transport rollers can be used.

- ▶ Ensure even load distribution on the load-bearing parts to prevent distortion of the bottom plate.



6 720 618 585-23.1RS

Fig. 6 Transporting the boiler on rollers (measurements in mm)



Protect boiler from contamination if the boiler is not to be taken into use immediately.



Dispose of packaging in an environmentally responsible manner.

## 5 Installing the boiler

### 5.1 Installation requirements



**NOTICE:** System damage due to frost!

- ▶ Set up the heating system in a room safe from the risk of frost.



**DANGER:** Dangers through explosive and easily flammable materials.

- ▶ Never use or store combustible materials (paper, curtains, clothing, thinners, paints, etc.) in the vicinity of the boiler.



**NOTICE:** Risk of boiler damage from contaminated combustion air.

- ▶ Never use chlorinated cleaning agents or halogenated hydrocarbons (as contained in spray cans, solvents, cleaning agents, paints and adhesives, for example).
- ▶ Never store or use such materials in the boiler room.
- ▶ Avoid very dusty atmospheres (building dust).



**NOTICE:** Boiler damage through overheating.

Excessive ambient temperatures can result in heating system damage.

- ▶ Ensure ambient temperatures above 0 °C and below 35 °C.

#### Preventing noise disturbance for end-users

- ▶ Where the boiler ambience is sensitive to noise (e.g. residential units), use the silencer options offered by the manufacturer (flue gas silencers, compensators).

### 5.2 Recommended wall clearances

When determining the installation location, take the clearances for the flue and the connection pipe assembly into consideration (→ Fig. 7 and Chapter 6 flue system connection and the pipework on the water and gas sides).



Where applicable, allow extra wall clearances for additional components, for example DHW cylinder, pipe connections or other components on the flue gas side etc.

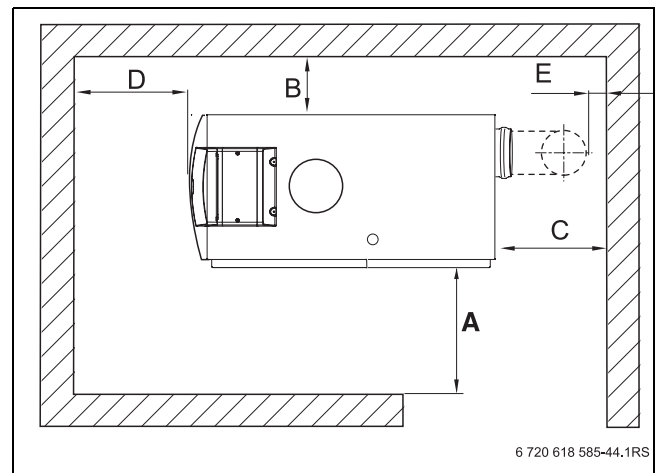


Fig. 7 Wall clearances in the installation room

Dimension	Wall clearance (mm)	
	minimum	recommended
A	700	1000
B	150	400
C <sup>1)</sup>	-	-
D	700	1000
E <sup>1)</sup>	150	400

Tab. 7 Recommended and minimum wall clearances (dimensions in mm). Maintain minimum clearance, dimension E.

1) This clearance dimension applies independently of the installed flue system.



### 5.3 Levelling the boiler

Level the boiler horizontally to prevent air pockets forming inside the boiler and to enable condensate to drain fully from the condensate tray.



**CAUTION:** Boiler damage through insufficient load-bearing capacity of the installation area or inadequate substrate.

- ▶ Ensure that the installation area offers sufficient load-bearing capacity.

- ▶ Bring the boiler into its final position.
- ▶ Level the boiler horizontally by means of its adjustable feet and a spirit level.

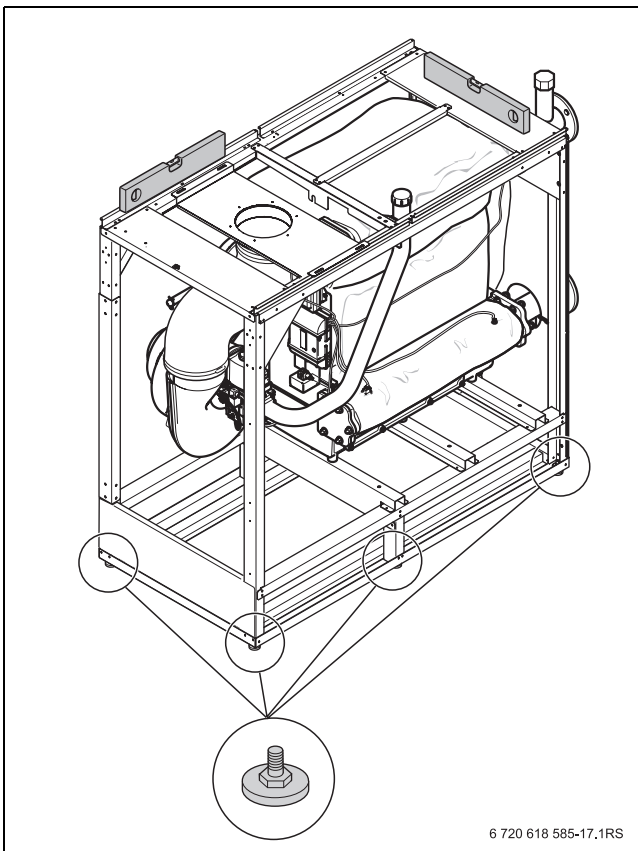


Fig. 8 Levelling the boiler

## 6 Installation

### 6.1 Making the flue connection

Observe all country-specific requirements when installing the flue system.

**i** Flue gas routing on multi-boiler systems (cascade).  
These instructions only concern single boiler systems. Only ask qualified contractors to calculate and size flue gas/combustion air systems for multi-boiler systems. Ask the manufacturer of the flue system to confirm and verify the calculations. The flue gas system must prevent a return flow of flue gas through boilers that are not in use.

**!** **DANGER:** Risk to life from escaping flue gases inside the installation room.  
▶ The gasket in the flue connection of the condensate tray must be present, in good order and correctly inserted.

Very different requirements apply to flue connection in different countries.

**!** **NOTICE:** System damage through incorrectly drained condensate.  
▶ Drain the condensate generated in the flue via the boiler flue connection directly into the siphon inside the boiler (→ Chapter 6.2). Boiler flue connection, condensate drain and condensate hose are part of the standard delivery.  
▶ Use the boiler flue connection that is part of the standard delivery.

- ▶ Plug boiler flue connection [2] into flue connection [1].
- ▶ Fit condensate hose [3] to the condensate drain of the boiler flue connection.
- ▶ Guide the condensate hose through the opening in the lower back panel.

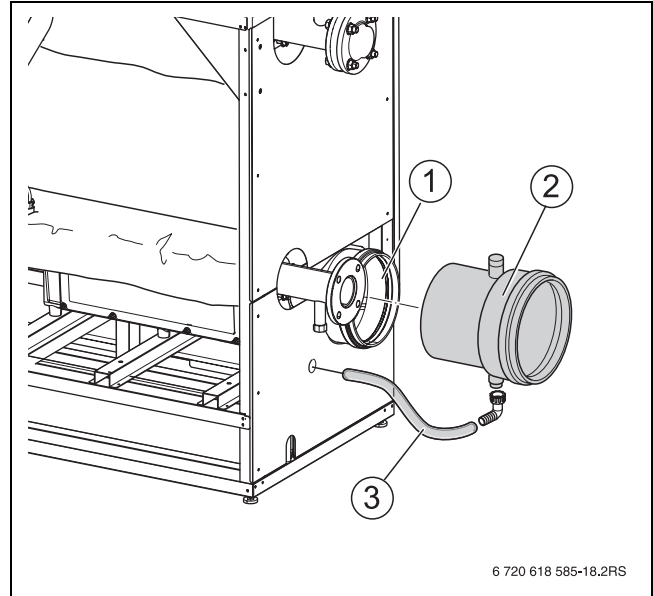


Fig. 9 Fitting the flue connection

- 1 Flue connection
- 2 Boiler flue connection with condensate drain
- 3 Condensate hose

- ▶ Make flue connection.

During the installation of the flue connection, observe the following:

- Country-specific requirements
- The flue pipe cross-section must comply with all current regulations
- Select the shortest possible flue length
- Secure the flue at appropriate intervals
- Ensure the connection is made free from stress, and that no loads are transferred to the flue connection.
- **During engineering and installation of the flue, create a layout that best favours the flue gas flow.**

**!** **DANGER:** Risk to life from toxic flue gases escaping.  
▶ Check the entire flue gas system for correctly made and sealed joints.

## 6.2 Installing the condensate hose



Information regarding the condensate hose.

- ▶ Carefully drain the condensate created inside the boiler and flue (route the flue with a slope towards the boiler).
- ▶ Drain the condensate into the public sewerage system in accordance with the requirements in your country.
- ▶ Observe regional regulations.



**DANGER:** Risk to life through poisoning! Open connections or siphons not filled with water can cause a risk to life from escaping flue gas.

- ▶ Fill the siphon with water.

- ▶ Remove the cap from the filler hole in the siphon supplied and fill with approx. 2 litres of water.
- ▶ Fit elbow [4] with inserted gasket onto the filler hole.
- ▶ Fit the condensate hose from flue system [3] with a hose clip to the elbow.
- ▶ Fit the siphon to the outlet on condensate tray [2].



Neutralising systems are available as accessories and can be fitted inside the boiler casing.

- ▶ Install neutralising systems (accessories) in accordance with the installation instructions, either inside the boiler or on site.
- ▶ Connect the condensate hose from the siphon with a slope to the neutralising system.



Where the neutralising system is installed outside the boiler, there is the option of guiding the condensate hose through the aperture in the back panel.

- ▶ Connect the condensate hose from the boiler flue connection with a slope to the neutralising system.

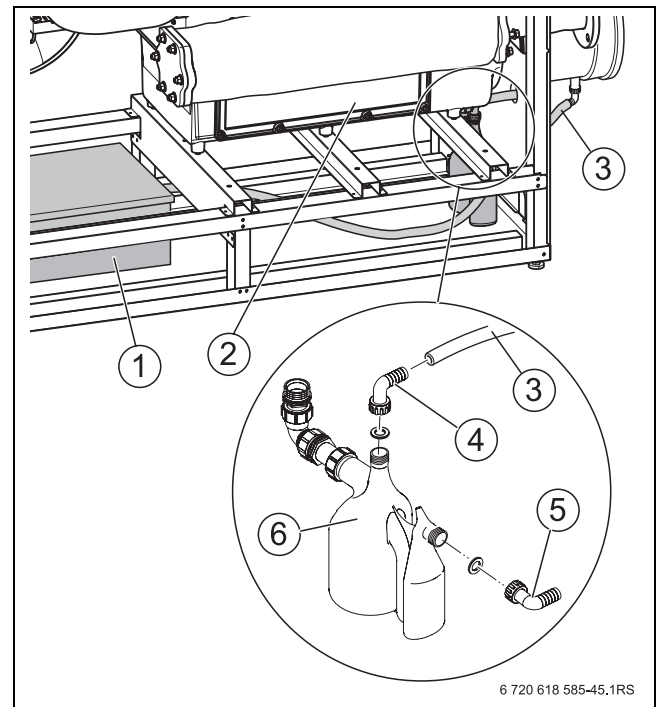


Fig. 10 Installing the condensate hose

- 1 Neutralising system (accessory)
- 2 Condensate tray
- 3 Condensate hose connection to the flue gas system
- 4 Elbow, filler hole
- 5 Siphon outlet to neutralising system or drain line
- 6 Siphon

- ▶ Make the connection to the sewerage system in accordance with the instructions of the neutralising system and locally applicable regulations.

### 6.3 Fitting the boiler cover

- ▶ Fit front boiler cover [1] with 4 screws to the frame.
- ▶ Fit rear boiler cover [2] with 4 screws to the frame.

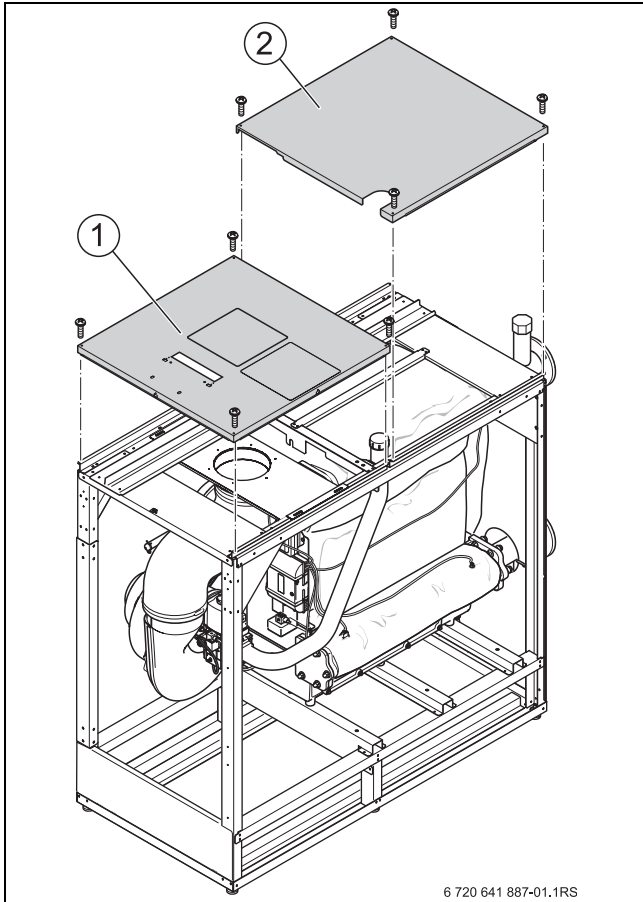


Fig. 11 Front and rear boiler covers

- 1 Front boiler cover
- 2 Rear boiler cover

### 6.4 Connecting the air supply (for balanced flue operation)

The combustion air is supplied to the boiler either through an external wall connection, through a shaft or through a separate pipe in the shaft.



An adaptor is available as an accessory for balanced flue operation.



We would recommend the installation of a silencer in the ventilation air line, subject to the air inlet aperture arrangement on the outside of the building.



Insulate the ventilation air line to prevent condensate being created in/on that line (inside and outside).

- ▶ Remove cover panel [1] from the front boiler cover.
- ▶ Fit adaptor [2] (accessory) on the cross-brace and seal with sealant (accessory).
- ▶ Insert and seal in a ventilation air bend in the adaptor.
- ▶ **In cascade arrangements, ensure that the boiler is equipped with a separate ventilation air line.**
- ▶ Create the ventilation air line up to the ventilation air bend using a standard air supply system in accordance with the requirements of the country concerned.

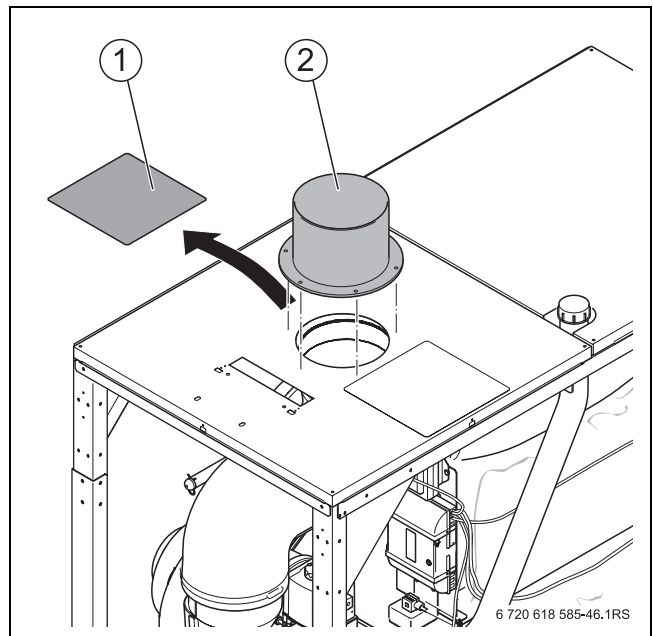


Fig. 12 Ventilation air connection for balanced flue operation (accessory)

- 1 Cover panel
- 2 Adaptor

## 6.5 Making the heating circuit connection



**NOTICE:** System damage due to leaking connections!

- ▶ Install all lines free from stress to the boiler connections.
- ▶ Use new gaskets if fittings need to be undone.
- ▶ Only tighten flanges on the heating flow and return after the connections have been made.
- ▶ Before installing the pipe connections, check connections and gaskets on the boiler for possible damage.

### Boiler flow (VK)

### Boiler return (RK)

DN80

PN6 standard flange EN1092

Tab. 8 Water connection dimensions

### 6.5.1 Connecting the flow

- ▶ Insert a gasket between the flange on the boiler and the threaded mating flange on the flow.
- ▶ Secure the flange connection with 4 screws, washers and nuts.

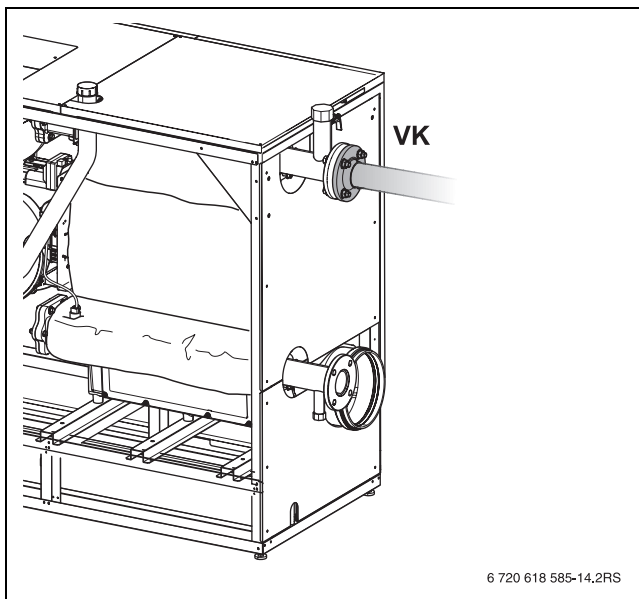


Fig. 13 Fitting the flow (VK)

### 6.5.2 Installing the safety assembly (on site)



**NOTICE:** System damage through incorrect installation.

- ▶ Always fit a safety valve and the automatic air vent valve or the safety assembly to the flow.



The safety assembly (accessory) comprises an automatic air vent valve and a pressure gauge. As an option, it may be converted for use with a safety valve (additional accessory) and a fitting manifold for the maximum pressure limiter.

If these accessories are not used, a safety valve, pressure gauge and an automatic air vent valve must generally be installed in the flow, upstream of the first shut-off valve.

- ▶ Seal in distributor [2] at flow connector [1] using a suitable sealant.
- ▶ Remove the union at the cap valve fitting [3].
- ▶ Fit union with gasket to connector of fitting manifold [4] and secure to the cap valve on the distributor.
- ▶ Level the fitting manifold and fit maximum pressure limiter [5].

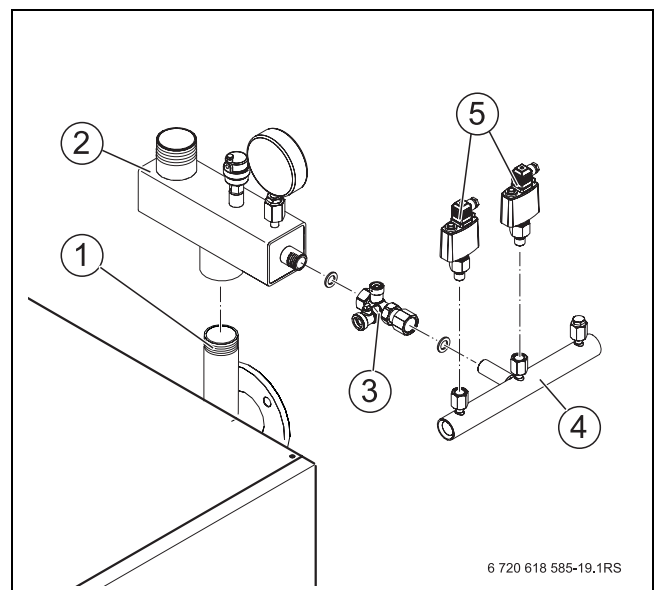


Fig. 14 Installing the fitting manifold

- 1 Flow connector
- 2 Distributor
- 3 Cap valve
- 4 Fitting manifold complete with cap valve 3/4 Inch
- 5 Maximum pressure limiter



Subject to operating pressure, different safety valves are required.

- ▶ At an operating pressure up to 3 bar, seal in the safety valve at the distributor connector with a suitable sealant.

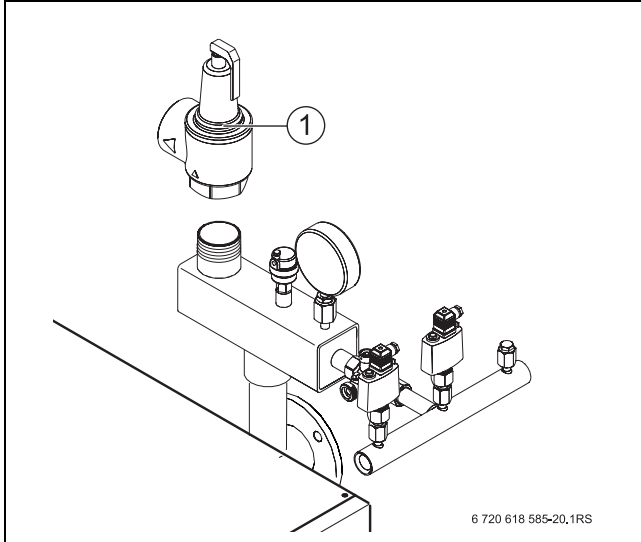


Fig. 15 Safety valve (up to 3 bar)

- 1 Safety valve

- ▶ At an operating pressure of 3 to 6 bar, seal in female connection [4] and threaded flange [3] at the distributor connector with a suitable sealant. Secure safety valve [1] with gasket [2] on the threaded flange.
- ▶ Fit the blow-off line to the respective safety valve.

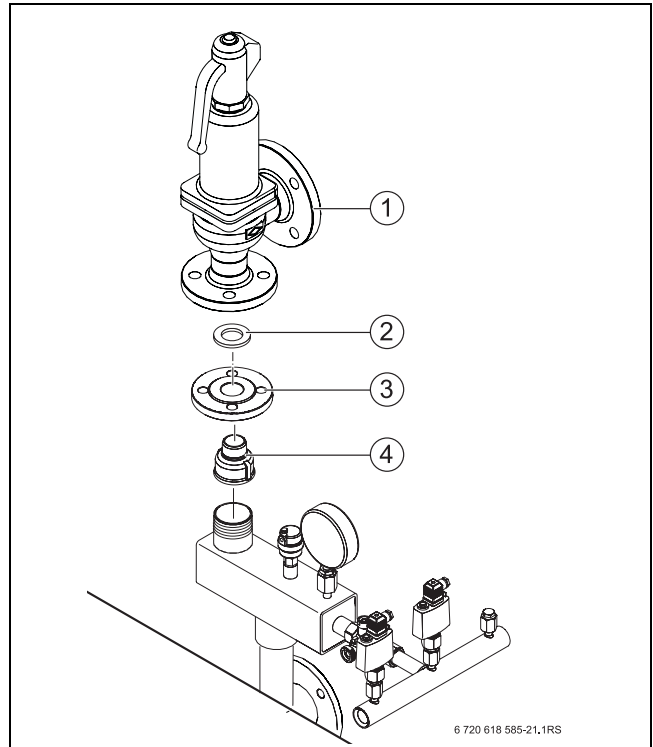


Fig. 16 Safety assembly (3 to 6 bar)

- 1 Safety valve
- 2 Gasket
- 3 Threaded flange
- 4 Fem. connection

### 6.5.3 Connecting the return



We recommend fitting a dirt filter (accessory) on site to the return to prevent contamination on the water side.

- ▶ Undo the threaded flange from the return line.
- ▶ Fit the threaded flange to the return line (on site) (→ Tab. 8, page 21).
- ▶ Insert a gasket between the flange on the boiler and the threaded mating flange on the return line.
- ▶ Secure the flange connection with 4 screws, washers and nuts.

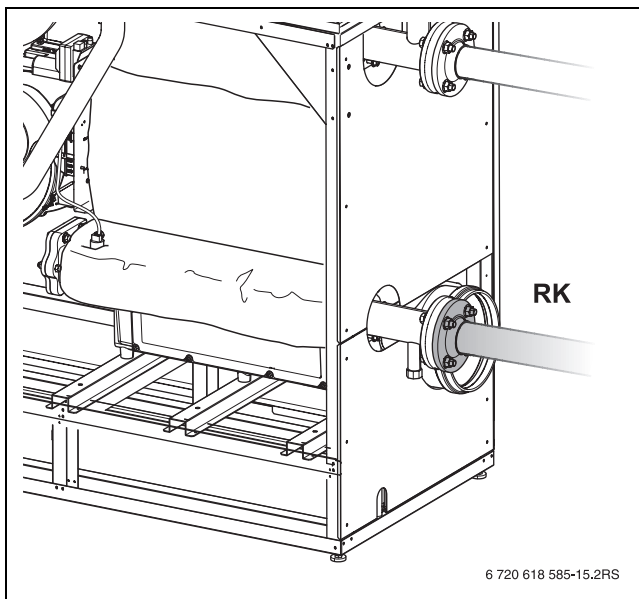


Fig. 17 Fitting the return (RK)

#### Connection the diaphragm expansion vessel (DEV)

To safeguard individual boilers, a DEV can be connected to the  $\frac{3}{4}$  inch connection on the return, in accordance with EN 12828.

- ▶ Install the DEV on site to maintain the system pressure in the return, upstream of the pump.

#### Connecting the drain & fill valve on site

- ▶ Install a drain & fill valve in the return.

### 6.5.4 Installing a DHW cylinder

Make the connection of a DHW cylinder to the flow and return on site. The MC10 + BC10 control unit can switch the required external cylinder primary pump (→ MC10/BC10 instructions).

## 6.6 Filling the heating system and checking for leaks

Before commissioning, check the heating system for leaks to prevent problems during operation.

- ▶ To ensure good ventilation, open all heating circuits and thermostatic valves prior to filling the system.

**NOTICE:** System damage through boiler scaling.

- ▶ Note the information specified in the operator's log.

**NOTICE:** Risk of system damage from excess pressure when testing for leaks. Pressure, control and safety equipment may be damaged by excessive pressure.

- ▶ After filling, pressure-test the heating system with a pressure equal to the response pressure of the safety valve.

**NOTICE:** System damage.

If the heating system is filled when hot, the resulting temperature stresses can cause stress cracks. The boiler will then leak.

- ▶ Only fill the heating system when cold (the flow temperature should not exceed 40 °C).
- ▶ **When the heating system is in operation, never fill it via the boiler drain & fill valve. Instead, only use the filling valve in the heating system pipework (return).**
- ▶ Pay attention to the water quality as specified in the operator's log, and record the volume and quality of fill water used.

**CAUTION:** Health risk from contaminated drinking water.

- ▶ Observe all regulations and standards applicable in your country regarding the prevention of drinking water contamination.
- ▶ In Europe, observe standard EN 1717.

- ▶ Open safety caps on all automatic air vent valves.
- ▶ Connect hose to the water tap. Push the water-filled hose onto the hose ferrule of the drain & fill valve, secure it with a hose clip and fill with water.

- ▶ Open the drain & fill valve. Slowly fill the heating system. During the filling observe the pressure gauge.

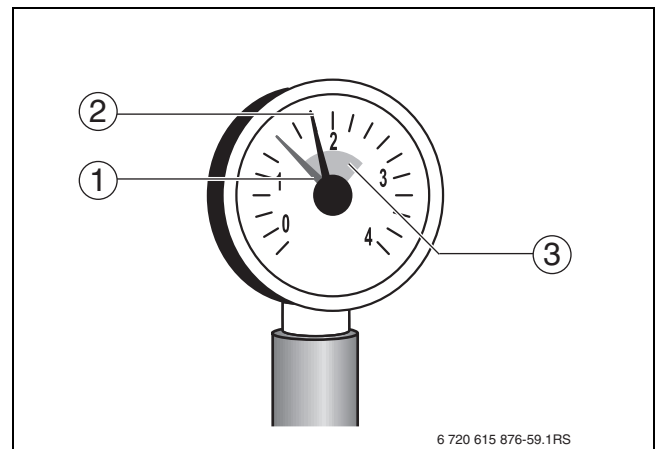


Fig. 18 Pressure gauge for sealed unvented systems

- 1 Red needle
- 2 Pressure gauge needle
- 3 Green band

- ▶ Close the water tap and the drain & fill valve once the required test pressure has been reached.
- ▶ Check the connections and pipework for leaks.
- ▶ Vent the heating system via the radiator bleed valves.
- ▶ Top up with water if the pressure drops as a result of bleeding the system.
- ▶ Undo the hose from the drain & fill valve.
- ▶ Carry out a leak test in accordance with locally applicable regulations.
- ▶ Once the heating system has been tested and no leaks have been found, set the correct operating pressure.



## 6.7 Making the electrical connection

The boiler can only function fully with an installed control unit.



**DANGER:** Risk to life from electric shock!

- ▶ Prior to all electrical installation work, isolate all poles of the power supply and secure against unintentional reconnection.

When connecting electrical components, also observe the connection diagram and instructions of the relevant product.



Observe the following points regarding the electrical connection:

- ▶ Electrical work on heating systems must only be carried out by qualified electricians. If you are not suitably qualified, have an electrical contractor carry out the electrical connections.
- ▶ Observe all local regulations.

### 6.7.1 Installing the control unit



Subject to preference, the control unit may be fitted in 2 different positions. The decorative fascia cannot be fitted.

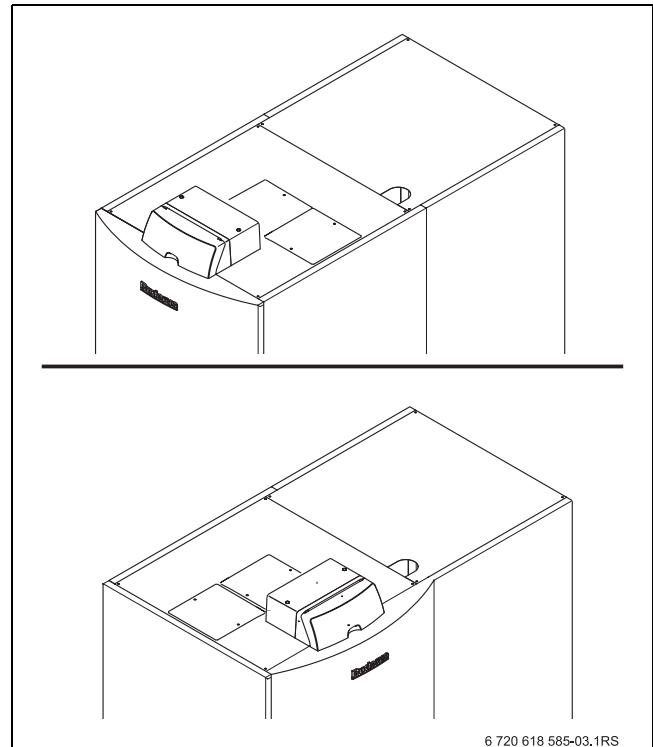


Fig. 19 Control unit installation versions

- ▶ Locate the push-in hooks of the control unit in the oval holes of the front boiler cover.
- ▶ Push the control unit towards the outside edge of the boiler.
- ▶ Let the resilient hooks of the control unit click into the openings by pushing the control unit.

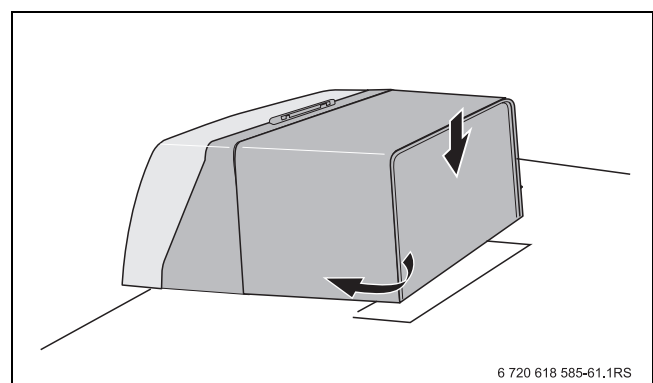


Fig. 20 Fitting the control unit (Logamatic MC10)

### 6.7.2 Making the power supply connection

Create a permanent power connection in accordance with local regulations.

- ▶ Release two screws on the control unit cover and remove the cover.

**⚡ DANGER:** Risk to life from electric shock. Incorrectly terminated cables can result in faulty operation and possible dangerous consequences.

- ▶ When making the electrical connections, observe the connection diagram of the MC10 and its installation instructions (part of the standard delivery of the control unit).

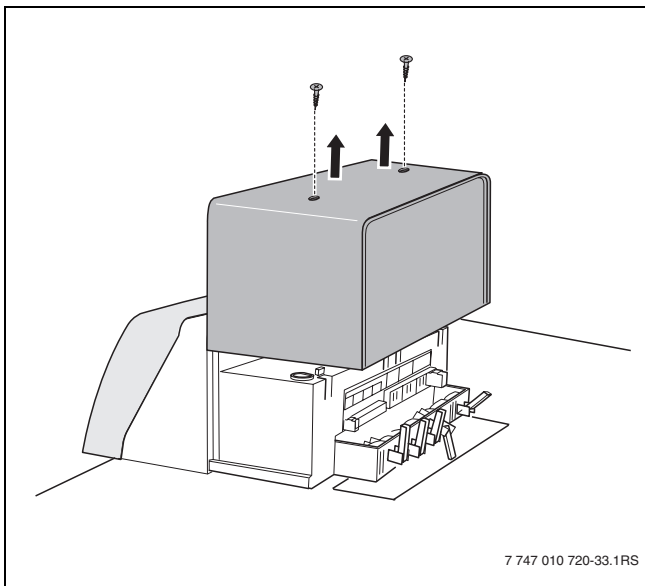


Fig. 21 Removing the cover

**⚡ DANGER:** Risk of fire through hot boiler components. Hot components may damage electrical cables and leads.

- ▶ Ensure that all cables are routed through the cable entries provided or along the boiler's insulation material.

**⚠ NOTICE:** System damage through incorrect control.

- ▶ Route high and low voltage cables/leads separately inside the cable trunking.

- ▶ Route all cables that run towards the back through the cable trunking.

- ▶ Route all cables through the cable entries to the control unit and connect in accordance with the connection diagram.

**⚠ NOTICE:** Operating faults through power failure.

- ▶ When connecting external components to the MC10 control unit, ensure that the total power consumption of these components does not exceed 5 A.

- ▶ Secure all cables with cable clips (part of the standard delivery).

1. Insert the cable clip together with the cable from the top into the slot in the frame.
2. Slide the cable clip downwards.
3. Counterhold.
4. Flip the lever up.

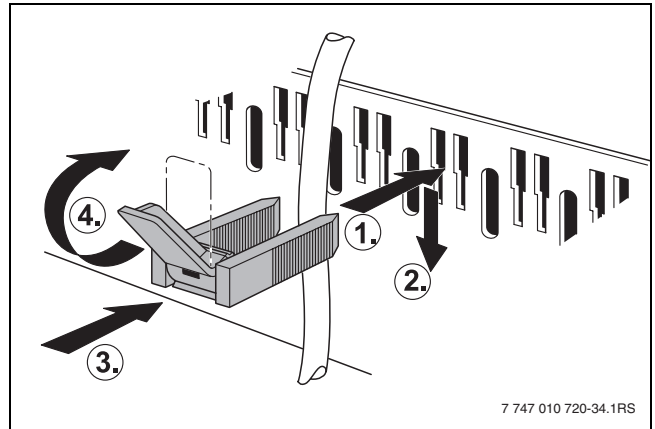


Fig. 22 Securing cables with cable clips

### Inserting the function module

In total, up to 2 function modules can be plugged into the control unit. Only one mixer module can be used as part of the system. For further supplementary modules, you require one complete enclosure (accessory).



Observe the installation instructions of the function module.

- ▶ Guide the outer rear hooks of the function module into the tabs on the control unit [1].
- ▶ Press the front of the module downwards.

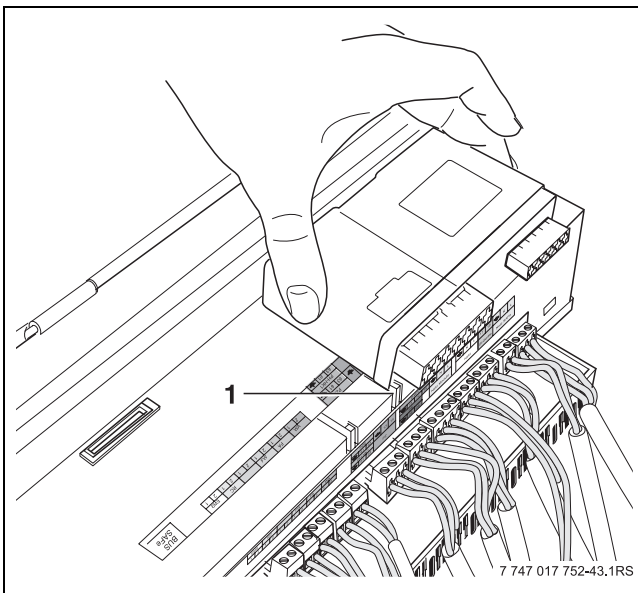


Fig. 23 Inserting the function module

### Fitting the cover

- ▶ Push the control unit cover down into the guide rails.
- ▶ Tighten two screws to secure control unit cover.

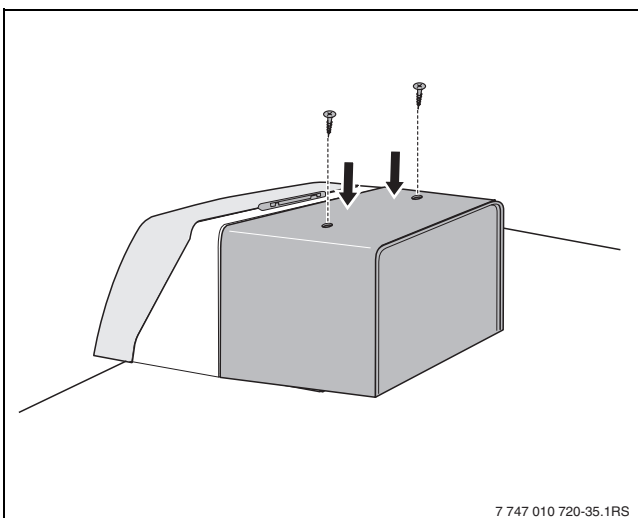


Fig. 24 Fitting the cover

## 6.8 Fuel connection



**DANGER:** Risk to life from explosion of flammable gases!

- ▶ Work on components in contact with gas must only be carried out by certified gas fitters.
- ▶ Observe all local regulations in connection with the gas connection.
- ▶ Seal in the gas connections with an approved sealant.

- ▶ Install gas tap R2" [2] in the gas line (GAS). During this operation, prevent the gas line inside the boiler from becoming twisted.



Subject to local regulations, install thermally activated shut-off equipment.

In addition, we recommend the installation of a gas filter and compensator in the gas line in accordance with local regulations.

- ▶ Connect compensator [1] (recommended) to the gas tap.
- ▶ Connect the gas line to the gas connection free of stress.
- ▶ Secure the gas line with pipe clips so that the gas connection is free from any stresses.
- ▶ Close the gas tap.

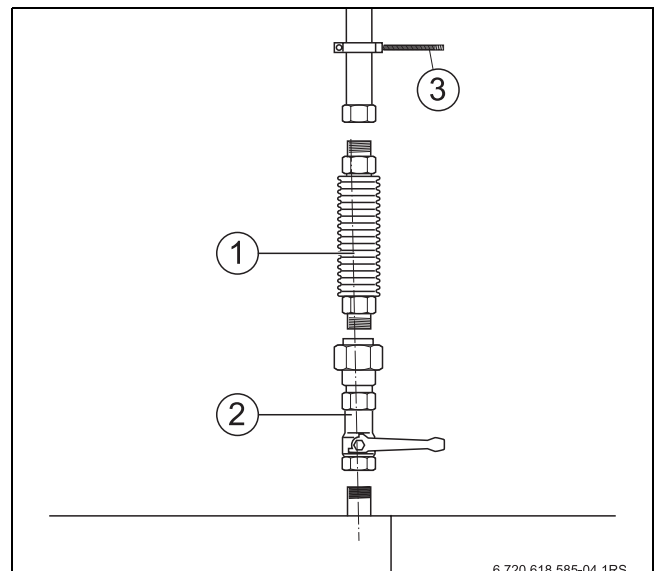


Fig. 25 Gas connection

- 1 Compensator
- 2 Gas tap (here with thermally activated shut-off equipment)
- 3 Pipe clip



For higher gas supply pressures than shown in Tab. 10, page 33, Buderus offers additional gas pressure regulators as accessories.

## 7 Commissioning the heating system

This chapter describes commissioning using the standard control unit module.

- ▶ After completing the work described below, complete the commissioning report (→ Chapter 7.18).



**NOTICE:** Boiler damage through excessive dust and dirt contamination in open flue operation.

Strong dust and dirt contamination can occur, for example, due to building work in the installation room.

- ▶ During building work, operate the boiler in balanced flue mode.



**NOTICE:** Risk of boiler damage from contaminated combustion air.

- ▶ Never use chlorinated cleaning agents or halogenated hydrocarbons (as contained in spray cans, solvents, cleaning agents, paints and adhesives, for example).
- ▶ Never store or use such substances in the installation room.

- ▶ A burner contaminated during building work must be cleaned before commissioning.
- ▶ Inspect flue and combustion air pipework (with balanced flue operation) and the apertures for combustion air supply and ventilation (→ Chapter 6.1, page 18).

### 7.1 Checking the operating pressure



This boiler cannot be operated with open vented heating systems.

- ▶ Prior to commissioning, check the operating pressure of the heating system on the water side and adjust if required.



**NOTICE:** System damage through boiler scaling.

- ▶ Note the information specified in the operator's log.

- ▶ Set the red needle [1] on pressure gauge to the required operating pressure of at least **1 bar**.

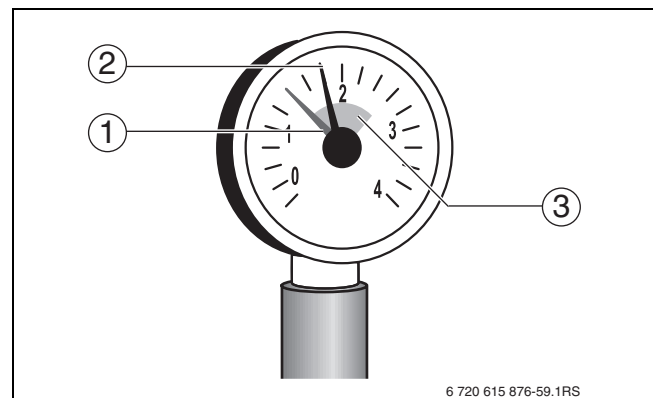


Fig. 26 Pressure gauge for sealed unvented systems

- 1 Red needle
- 2 Pressure gauge needle
- 3 Green band



**CAUTION:** Health risk from contaminated drinking water!

- ▶ Observe all national standards and regulations regarding prevention of domestic water contamination (e.g. by water from heating systems).
- ▶ In Europe, observe standard EN 1717.

- ▶ Top up heating water or drain off water via the on-site drain & fill valve until the required operating pressure has been reached.
- ▶ During filling, vent the heating system via the radiator bleed valves.

## 7.2 Checking for leaks

Prior to commissioning, check all new line sections on the gas side for external gas tightness.



**DANGER:** Risk of explosion!

There is a risk of explosion if gas lines and gas connections leak.

- ▶ Carry out an appropriate tightness test with a foaming agent.



**DANGER:** Risk of system damage due to short circuit.

- ▶ Cover the areas at risk before performing a tightness test, e.g. the internal water pressure sensor and the return sensor on the boiler return.
- ▶ Never spray or let leak detection agent drip onto cable entries, plugs or electrical cables/leads.

- ▶ Check the new pipe section, including the seal at the gas valve, for external leaks.  
The test pressure on the gas valve inlet must be no higher than 150 mbar.



If a leak is discovered during this test, all connections must be checked using a foaming agent. The agent must be approved for gas tightness testing.

- ▶ Never allow the agent to come in contact with electrical cables.

- ▶ Confirm in the commissioning report that the tightness test has been carried out.

## 7.3 Recording gas characteristics

Ask your gas supply utility to advise you of the gas parameters (Wobbe index and calorific value) and record these in the commissioning report (→ Chapter 7.18, page 38).

### 7.4 Check the system equipment level

In its delivered condition, the burner is fully adjusted for use with natural gas H or L. Should it be discovered that the boiler was ordered for the incorrect gas type, convert the type and update the type plate accordingly.

- ▶ Ask your gas supply utility about the type of gas supplied.
- ▶ Check that the actual gas type matches the “Gas type” label.

- ▶ Affix label [2] (supplied with the boiler) over the appropriate area on the type plate [1] (on the back panel).

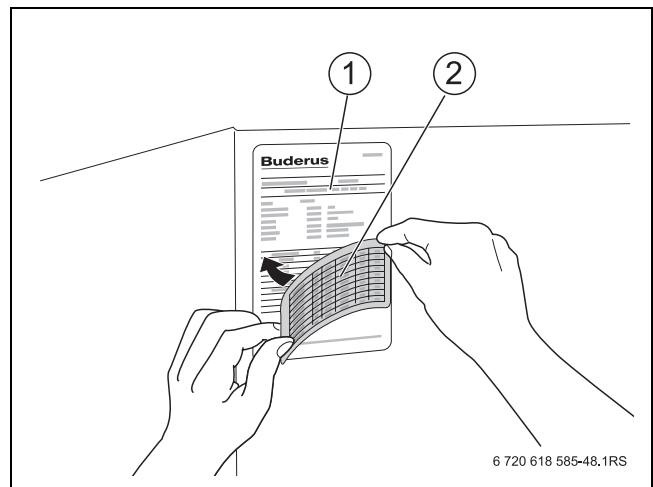


Fig. 27 Updating the type plate

Country	Gas type	Factory settings
AT, BA, BG, BY, CH, CN, CZ, DE, DK, EE, ES, FR, GB, GR, HR, HU, IE, IT, LU, NO, PL, PT, RO, RU, SE, SI, SK, UA	Natural gas H or E (G20)	Factory-set ready for use. The gas valve is adjusted and sealed.  Wobbe index for 15 °C, 1013 mbar: <ul style="list-style-type: none"> <li>• Adjusted to 14.1 kWh/m<sup>3</sup></li> <li>• Applicable for 11.4 to 15.2 kWh/m<sup>3</sup></li> </ul> Wobbe index for 0 °C, 1013 mbar: <ul style="list-style-type: none"> <li>• Adjusted to 14.9 kWh/m<sup>3</sup></li> <li>• Applicable for 12.0 to 16.1 kWh/m<sup>3</sup></li> </ul>
DE	Natural gas L	Factory-set ready for use. The gas valve is adjusted and sealed.  Wobbe index for 15 °C, 1013 mbar: <ul style="list-style-type: none"> <li>• Adjusted to 12.1 kWh/m<sup>3</sup></li> <li>• Applicable for 11.4 to 12.4 kWh/m<sup>3</sup></li> </ul> Wobbe index for 0 °C, 1013 mbar: <ul style="list-style-type: none"> <li>• Adjusted to 12.8 kWh/m<sup>3</sup></li> <li>• Applicable for 12.0 to 13.1 kWh/m<sup>3</sup></li> </ul>
NL	Natural gas L (G25)	Factory-set ready for use. The gas valve is adjusted and sealed.  Wobbe index for 15 °C, 1013 mbar: <ul style="list-style-type: none"> <li>• Adjusted to 11.5 kWh/m<sup>3</sup></li> <li>• Applicable for 10.85 to 12.4 kWh/m<sup>3</sup></li> </ul> Wobbe index for 0 °C, 1013 mbar: <ul style="list-style-type: none"> <li>• Adjusted to 12.2 kWh/m<sup>3</sup></li> <li>• Applicable for 10.6 to 13.8 kWh/m<sup>3</sup></li> </ul>

Tab. 9 Factory settings

## 7.5 Purging the gas line

- ▶ Undo the threaded plug on the test nipple for gas supply pressure and venting by two turns and affix the hose.
- ▶ Slowly open the gas tap.
- ▶ Flare off escaping gas via a hydraulic seal. Remove the hose when no more air is expelled, and tighten the threaded plug.
- ▶ Close the gas tap.

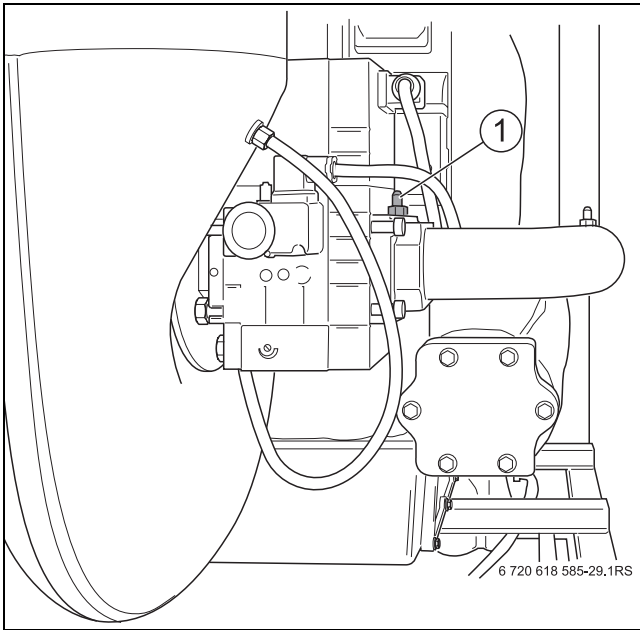


Fig. 28 Purging the gas line

- 1 Test nipple for measuring the gas supply pressure and for venting

## 7.6 Checking the ventilation and extract air apertures and the flue connection

- ▶ Check whether the apertures for ventilation and extract air comply with locally applicable regulations or those of your gas supply utility. Have any faults removed immediately.



### **DANGER:** Risk to life through poisoning!

An insufficient supply of air can result in dangerous escape of flue gas.

- ▶ Never block ventilation and extract air apertures or reduce their size.
- ▶ The boiler must not be operated, unless you immediately remedy the fault.
- ▶ Inform the system operator in writing of the problem and associated risk.

- ▶ Check that the flue connection complies with all current regulations (→ Chapter 6.1, page 18).
- ▶ Have any faults removed immediately.

## 7.7 Preparing the heating system for operation

- ▶ Open the fuel supply at the main shut-off valve and upstream of the gas valve.
- ▶ Switch on the heating system emergency stop switch (if installed) and/or insert/set the corresponding domestic fuse/circuit breaker.

## 7.8 Commissioning the control unit and burner

### 7.8.1 Switching on the boiler on the BC10

- ▶ Set the rotary selector for “maximum boiler temperature” and the rotary selector for “set DHW temperature” to 0. This ensures that the burner will not start yet (there is no heat demand).
- ▶ Set the ON/OFF switch on the base controller to position “1”. The entire heating system is switched ON. When starting for the first time “-” flashes briefly on the display, immediately before fault message “4A”-“700” appears. Fault message “4A”-“700” is displayed, as the burner is delivered in its fault state.
- ▶ Wait approx. 1 minute to enable the EMS connection to the RC35 programming unit (available separately) to be established.

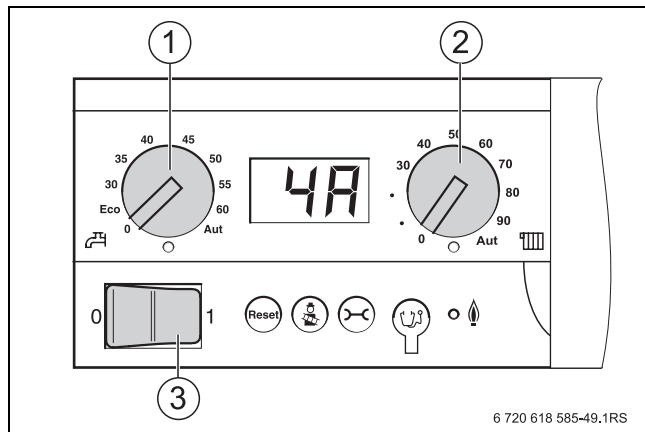


Fig. 29 Logamatic BC10 base controller

- 1 “Set DHW temperature” rotary selector
  - 2 “Maximum boiler temperature” rotary selector
  - 3 ON/OFF switch
- ▶ Press “Reset” on the BC10. The status display on the BC10 illuminates and the display shows the current boiler water temperature in °C.


If fault message “A11” appears, set the date and time on the RC35 programming unit. Only then will the current boiler water temperature be displayed.

Before continuing with further commissioning steps, set the correct parameters on the RC35 programming unit. In particular the DHW heating configuration (heating circuit pump and cylinder primary pump) must be set appropriately to ensure the heating system works correctly. For this, observe the installation and service instructions of the RC35 programming unit.



**i** When using the Logamatic 4000 control system, take the following commissioning steps:

- ▶ Switch off the Logamatic 4000 control unit.
- ▶ Install the RC35 programming unit.

### 7.8.2 Carrying out a flue gas test

The  key is used by heating contractors to carry out a flue gas test.

The heating control unit operates for 30 minutes at a higher flow temperature (ensure heat is drawn off at this time). During the flue gas test, the decimal point illuminates in the status display.

- ▶ Press , until the decimal point in the status display illuminates (min. 2 seconds).
- ▶ Carry out a flue gas test.
- ▶ To terminate the flue gas test, press  again.

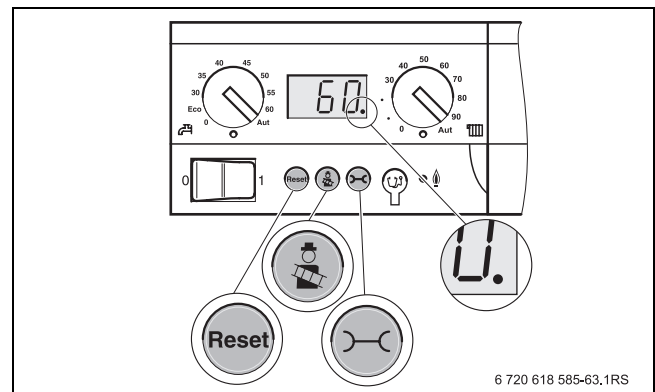
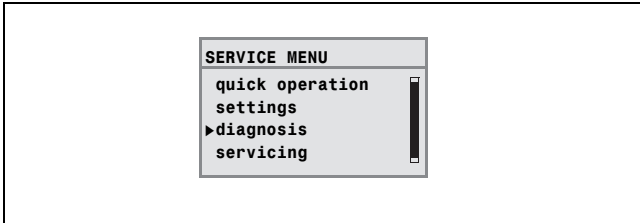


Fig. 30 Accessing the flue gas test

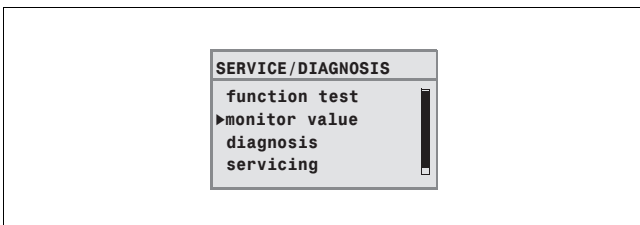


### 7.8.3 Accessing the service level on the RC35 and displaying monitoring data

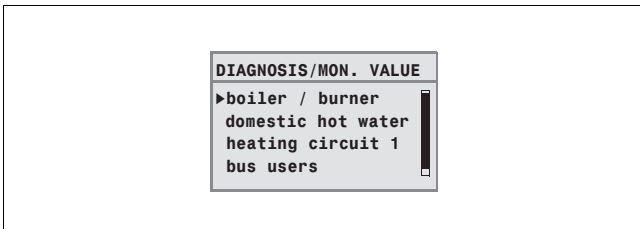
- ▶ Press + + simultaneously to open the **SERVICE MENU** menu.
- ▶ Turn rotary selector anticlockwise until **diagnosis** is selected (marked with ▶).



- ▶ Press to open the **SERVICE/DIAGNOSIS** menu.
- ▶ Turn rotary selector anticlockwise until **monitor value** is selected (marked with ▶).



- ▶ Press to open the **DIAGNOSIS/MON. VALUE** menu.
- ▶ Turn rotary selector anticlockwise until **boiler / burner** is selected (marked with ▶).



- ▶ Press to open **BOILER / BURNER** menu. The values monitored are displayed as a list; in other words, more values might appear if the rotary selector is turned.

The current burner output (set/actual) and the flame current can be checked in these menus.

### 7.9 Testing the gas supply pressure

- ▶ Undo the threaded plug on the test nipple for gas supply pressure and venting by two turns.
- ▶ Push the test hose of the pressure gauge onto pressure test nipple [1].
- ▶ With the burner operational (high load), check the gas supply pressure and record the value in the commissioning report (→ Chapter 7.18).
- ▶ If the gas supply pressure falls outside the values in Tab. 10, shut down the boiler and notify the gas supply utility.



If the burner is switched off from a high load and a gas supply pressure of > 50 mbar results, shut down the boiler and notify the gas supply utility (do not proceed with commissioning).

- ▶ Remove the test hose.
- ▶ Carefully tighten the threaded plug on the test nipple for gas supply pressure.

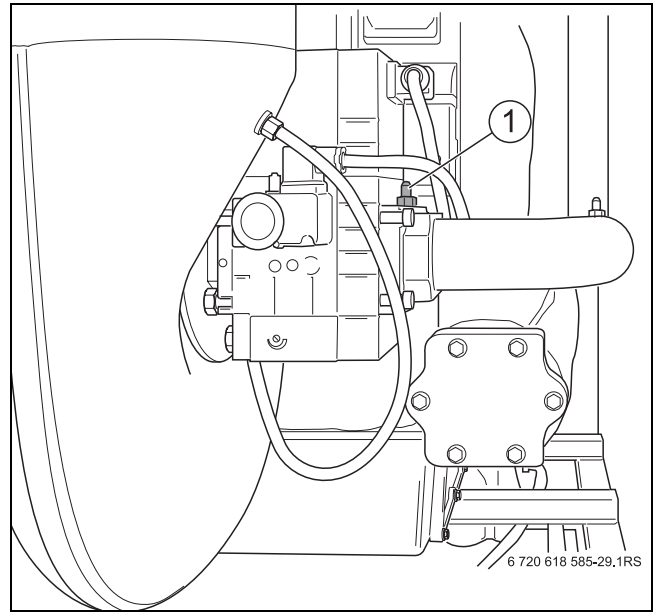


Fig. 31 Testing the gas supply pressure

- 1 Pressure test nipple for testing the gas supply pressure and for venting

Country	Gas type	Supply pressure at high loads <sup>1)</sup> [mbar]		
		Min	Rated	Max
AT, BE, BA, BG, BY, CH, CN, CZ, DE, DK, EE, ES, FR, GB, GR, HR, IE, IT, LU, NO, PL, PT, RO, RU, SE, SI, SK, UA	Natural gas H or natural gas L (G25)	17	20	25
NL	Natural gas L (G25)	20	25	30
HU	Natural gas H (G20) natural gas L (G25.1)	20	25	33

Tab. 10 Gas types and supply pressures

- 1) The gas supplier must guarantee the minimum and maximum pressures (acc. to national regulations for public gas supply).



For higher supply pressures than shown in Tab. 10, Buderus offers additional gas pressure regulators as accessories.

## 7.10 Checking and adjusting the gas:air ratio

### 7.10.1 Setting and checking the CO<sub>2</sub> values under full load

- ▶ Read off load at the RC35 or via the service key.
- ▶ Wait until at least 70 % of the load is reached.
- ▶ Insert the test sensor through the test port (→ Fig. 36, page 35) in the flue into the core flow and check the CO<sub>2</sub> content.
- ▶ In the case of CO<sub>2</sub> values below 8.5 % or above 9.6 %, correct the setting on the high load adjusting screw to 9.1 % (see Fig. 32).
  - Turning clockwise will reduce the CO<sub>2</sub> level.
  - Turning anticlockwise increases CO<sub>2</sub>.
- ▶ Recheck the CO<sub>2</sub> content and enter the value into the commissioning report, Chapter 7.18, page 38.

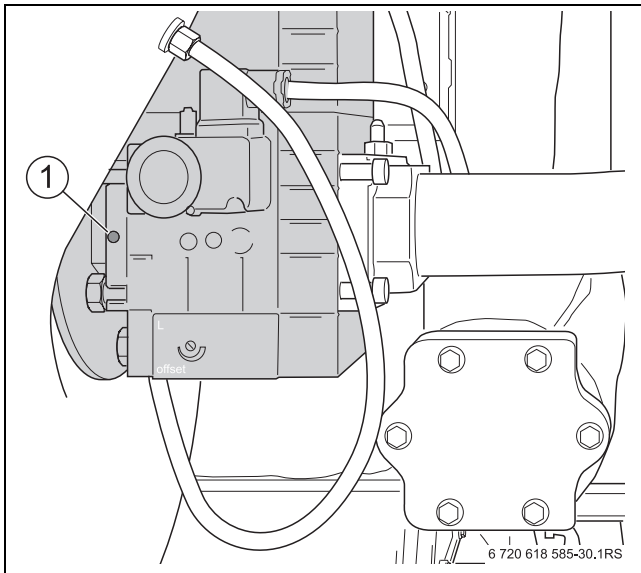





Fig. 32 Checking the CO<sub>2</sub> setting at full load

1 High load adjusting screw

### 7.10.2 Setting and checking the CO<sub>2</sub> values under partial load

- ▶ Press , until the decimal point in the status display **illuminates** (min. 2 seconds). This turns on the flue gas test.
- ▶ Hold down  and  simultaneously for approx. 5 seconds.

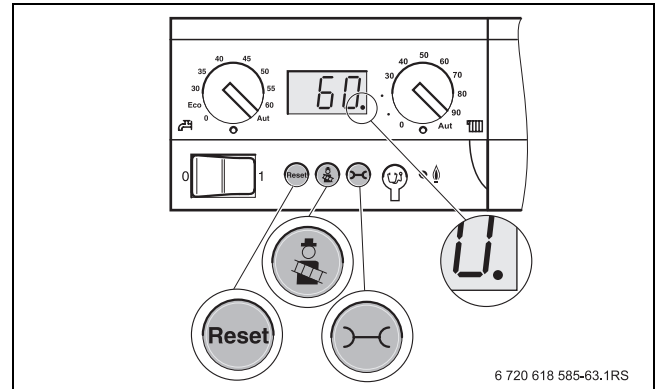



Fig. 33 Accessing partial load at the BC10

With standard settings, the display shows “L - -”.

- ▶ Press  to reduce the boiler output in percent until “L20” is displayed.
- ▶ Read off load at the RC35 or via the service key.
- ▶ Wait until 20 % of the load is reached.
- ▶ Insert the test sensor through the test port (→ Fig. 36, page 35) in the flue into the core flow and check the CO<sub>2</sub> content.
- ▶ In the case of CO<sub>2</sub> values below 9.0 % or above 9.6 %, correct the setting on partial load adjusting screw [1] to 9.3 %.
  - Turning clockwise will reduce the CO<sub>2</sub> level.
  - Turning anticlockwise increases CO<sub>2</sub>.
- ▶ Recheck the CO<sub>2</sub> content and enter the value into the commissioning report, Chapter 7.18, page 38.

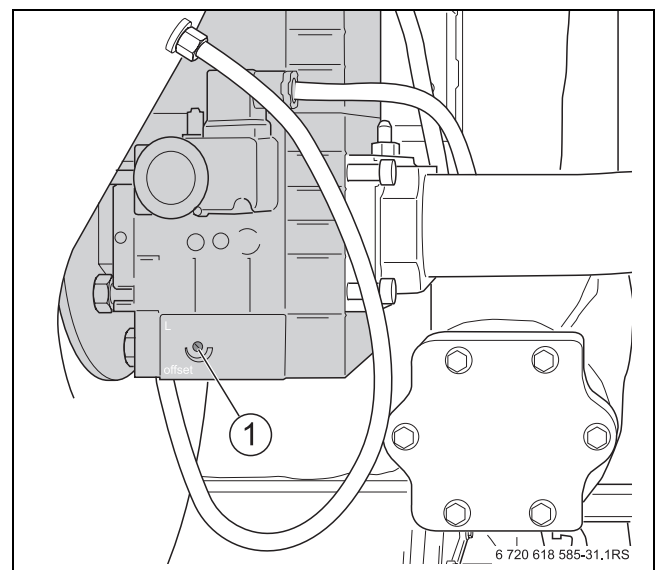



Fig. 34 Checking the setting under partial load

### 7.10.3 Checking the CO<sub>2</sub> setting under full load

- ▶ Press  to increase the boiler output in percent.
- ▶ Read off load at the RC35 or via the service key.
- ▶ Wait until at least 70 % of the load has been reached.
- ▶ Recheck the CO<sub>2</sub> content and correct if required (→ Chapter 7.10.1).

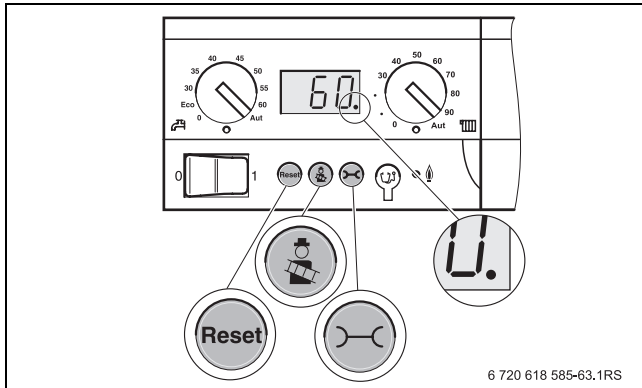






Fig. 35 Accessing full load at the BC10

### 7.11 Switching the status display on the BC10 to show the boiler temperature status

- ▶ Press  to change to the next status display. The current operating pressure P1.1 is displayed.
- ▶ Press  to change to the next status display. Operating status 04 (display code) is shown.
- ▶ Press  to change to the next status display. The boiler temperature is displayed.

### 7.12 Returning to operating mode from the flue gas test

- ▶ Press  again to terminate the flue gas test.
- ▶ Return to operating mode on the RC35.
- ▶ Close the flap on the RC35.
- ▶ If the boiler is designed for operation with the Logamatic 4000 control system, remove the RC35 again. Starting the Logamatic 4000 control system.

### 7.13 Recording actual values

- ▶ Carry out the following tests at a test port in the boiler flue connection and enter the results in the commissioning report (→ Chapter 7.18):
  - Draught
  - Flue gas temperature  $t_A$
  - Air temperature  $t_L$
  - Net flue gas temperature  $t_A - t_L$
  - Carbon dioxide content (CO<sub>2</sub>) or oxygen content (O<sub>2</sub>)
  - CO value

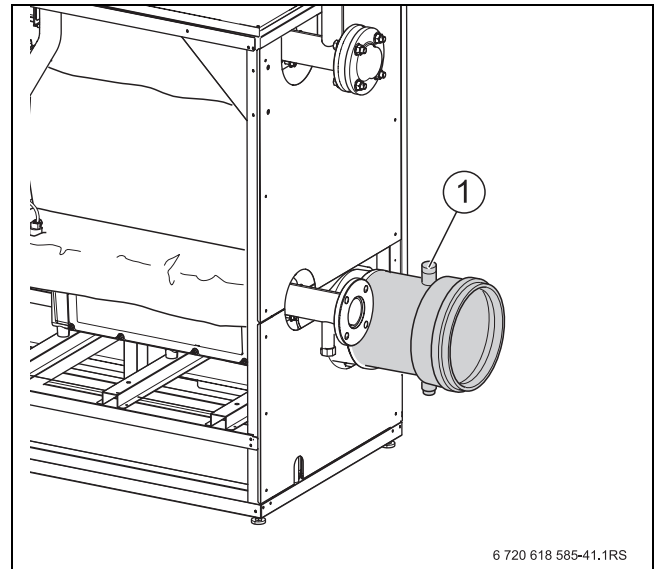



Fig. 36 Recording actual values

- 1 Position of the test port in the flue

#### 7.13.1 Draught

The required draught for the installed balanced flue system must not exceed 100 Pa (1.0 mbar).



**DANGER:** Risk to life from toxic flue gases escaping.

- ▶ Only operate the boiler with a chimney or flue gas system (→ Tab. 3, page 11).

#### 7.13.2 CO value

CO values in an air-free state must be below 400 ppm or 0.04 % vol.

Values above 100 ppm indicate and incorrect burner adjustment, incorrect appliance setup, burner and/or heat exchanger contamination or burner faults.





- ▶ Identify and eliminate the cause.

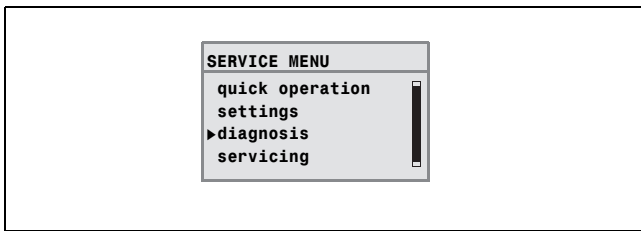
## 7.14 Function checks

During commissioning and the annual inspection, check all regulating, control and safety equipment for correct function and, where applicable, for the correct settings.

### 7.14.1 Checking the ionisation current (flame current)

#### Accessing the service level on the RC35



- ▶ Open flap on RC35.
- ▶ Press  +  +  simultaneously to open the **SERVICE MENU** menu.
- ▶ Turn rotary selector  anticlockwise until **diagnosis** is selected (marked with ▶).



- ▶ Press  to open the **SERVICE/DIAGNOSIS** menu.
- ▶ Turn rotary selector  anticlockwise until **diagnosis** is selected (marked with ▶).
- ▶ Press  to open the **SERVICE/DIAGNOSIS** menu.



The menu items shown will vary depending on the heating system.

- ▶ Hold down  and turn rotary selector  simultaneously to change the setting, e.g. flame current.  
The change takes effect when you release the key.
- ▶ Check the ionisation current and enter the value into the commissioning report (→ Chapter 7.18).  
To ensure fault-free operation, the ionisation current at partial and full load (and with burning flame) should be at least 3 µA.
- ▶ Return to operating mode on the RC35.
- ▶ Close the flap on the RC35.

## 7.15 Checking for leaks during operation

- ▶ With the burner operational, use a foaming agent to test all sealed points in the entire burner gas train, such as:
  - Test nipple
  - Threaded plug for gas supply pressure
  - Fittings (also at the gas connection) etc.

The agent must be approved for gas tightness testing.



**CAUTION:** Risk of system damage due to short circuit.

- ▶ Cover the areas at risk before performing a tightness test, e.g. the internal water pressure sensor and the return sensor on the boiler return.
- ▶ Never spray leak detection agent onto cable entries, plugs or electrical cables. Do not allow it to drip onto them either.
- ▶ To prevent corrosion, carefully wipe off the leak detection agent afterwards.

## 7.16 Installing casing parts

- ▶ Hook in the rear side panels first at the bottom (excluding insulation) [3], then raise slightly and hook in at the top.
- ▶ Using locking screws, secure the rear side panels to the boiler back panel [3].
- ▶ Hook in the front side panels first at the bottom (including insulation) [2], then raise slightly and hook in at the top.
- ▶ Using locking screws, secure the front side panels at the front [2] of the boiler.
- ▶ First hook in the bottom of the front panel [1], then raise slightly and hook in at the top.
- ▶ With locking screws, secure the top of the front panel [1] to the boiler.
- ▶ Affix the clear pocket containing the technical documentation in a clearly visible spot on the side of the boiler.

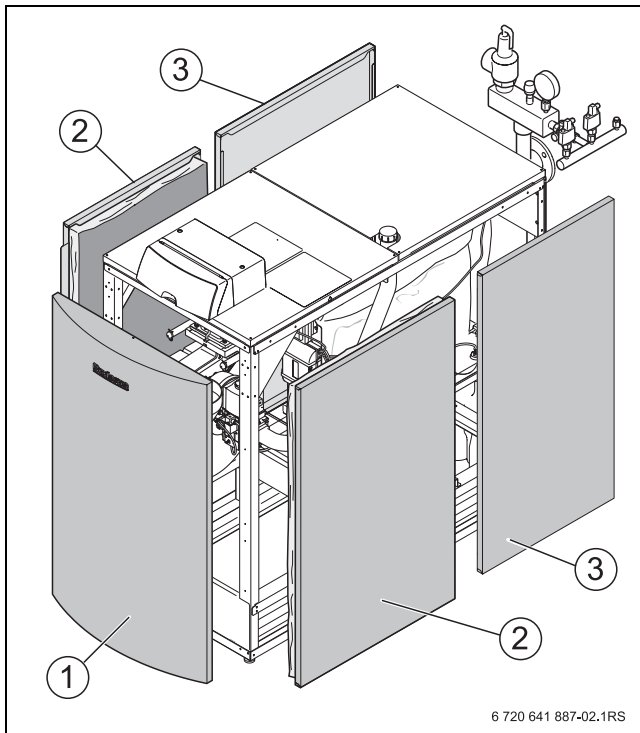


Fig. 37 Installing casing parts

- 1 Front
- 2 Front side panels (incl. thermal insulation)
- 3 Rear side panels (excl. thermal insulation)

## 7.17 Informing the owner/operator and handing over technical documentation

- ▶ Familiarise the owner/operator with the entire heating system and the operating instructions for the boiler.
- ▶ Together with the owner/operator, carry out a shutdown and restart.
- ▶ Explain to the customer what to do in an emergency, e.g. a fire, referring to the operating instructions.
- ▶ Hand over the technical documentation to the owner/operator, and together sign the commissioning report (→ Chapter 7.18).

**7.18 Commissioning report**

- Confirm commissioning as complete; sign and date the report.

Commissioning tasks		Page	Actual values		Comments
1.	Fill the heating system and check for leaks	24	<input type="checkbox"/>		
2.	Have the details regarding water quality in the operator's log been observed?		Yes: <input type="checkbox"/>		
	- Levels of concentration of additives		Additives: _____	Levels of concentration: _____ %	
3.	Record gas parameters: Wobbe index Calorific value	30	_____ kW/m <sup>3</sup>	_____ kW/m <sup>3</sup>	
4.	Check the gas pipe for tightness	29	<input type="checkbox"/>		
	- Vent gas line	31	<input type="checkbox"/>		
5.	Create operating pressure	28	<input type="checkbox"/>		
6.	Check the ventilation and extract air apertures and the flue connection	31	<input type="checkbox"/>		
7.	Check the system equipment level	30	<input type="checkbox"/>		
8.	Commission the control unit and burner	32	<input type="checkbox"/>		
9.	Adjust gas type if required	31			
10.	Record actual values:	35	Full load	Partial load	
	- Draught		_____ Pa	_____ Pa	
	- Gross flue gas temperature $t_A$		_____ °C	_____ °C	
	- Air temperature $t_L$		_____ °C	_____ °C	
	- Net flue gas temperature $t_A - t_L$		_____ °C	_____ °C	
	- Carbon dioxide content (CO <sub>2</sub> ) or oxygen content (O <sub>2</sub> )		_____ %	_____ %	
	Flue gas losses $q_A$		_____ %	_____ %	
	- CO value, free of air		_____ ppm	_____ ppm	
11.	Test the gas supply pressure	33	_____ mbar		
12.	Check for leaks during operation	36	<input type="checkbox"/>		
13.	Function checks	36			
	- Check ionisation current		_____ µA		
14.	Install casing parts	37	<input type="checkbox"/>		
15.	Inform operator; hand over technical documentation	37	<input type="checkbox"/>		
16.	Correct commissioning by the installing contractor		Signature: _____		
17.	Operator signature		Signature: _____		

Tab. 11 Commissioning report

## 8 Shutting down the heating system



### **NOTICE:** System damage due to frost!

When the heating system is switched off, it can freeze up if there is a frost.

- ▶ In case of a risk from frost, protect the heating system against frost damage. To do so, drain the heating water at the lowest point of the heating system. Do this by opening the air vent valve at the highest point in the heating system.

### 8.1 Shutting down the heating system via the control unit

Shut down the heating system via the Logamatic base controller BC10. The burner shuts down automatically. For more detailed information about using the Logamatic base controller BC10, see Chapter 7.

- ▶ Switch the heating system OFF at the ON/OFF switch on the BC10.
- ▶ Close the main fuel shut-off valve.

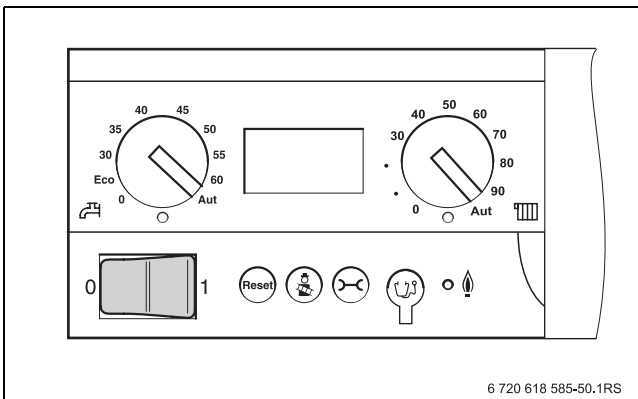


Fig. 38 Logamatic BC10 base controller

### 8.2 Shutting down the heating system in emergencies



Only in emergencies, switch OFF the heating system via the installation room fuse/circuit breaker or the heating system emergency stop switch.

Explain to the customer what to do in an emergency, e.g. a fire.

- ▶ Never risk your own life. Your own safety is paramount.
- ▶ Close the main fuel shut-off valve.
- ▶ Isolate the heating system from the mains power supply by means of the heating system emergency stop switch or the appropriate domestic fuse/circuit breaker.

## 9 Inspection and maintenance

Heating systems should be regularly serviced for the following reasons:

- to maintain a high level of efficiency and to operate the system economically (low fuel consumption),
- to achieve a high level of operational reliability,
- to maintain the cleanest possible combustion,
- to ensure reliable operation and long service life.

Maintenance must only be carried out by qualified service engineers. If parts are replaced, use exclusively Buderus-approved components. A service must be carried out once a year. The results of the services must be recorded in the inspection and maintenance report.

Offer your customer an annual contract covering inspection and demand-dependent service. The work that needs to be included in a maintenance contract is detailed in the inspection and maintenance reports (→ Chapter 9.14, page 52).



Spare parts can be ordered from the Buderus spare parts service.

### 9.1 Preparing the boiler for servicing



**DANGER:** Risk to life from electric shock!

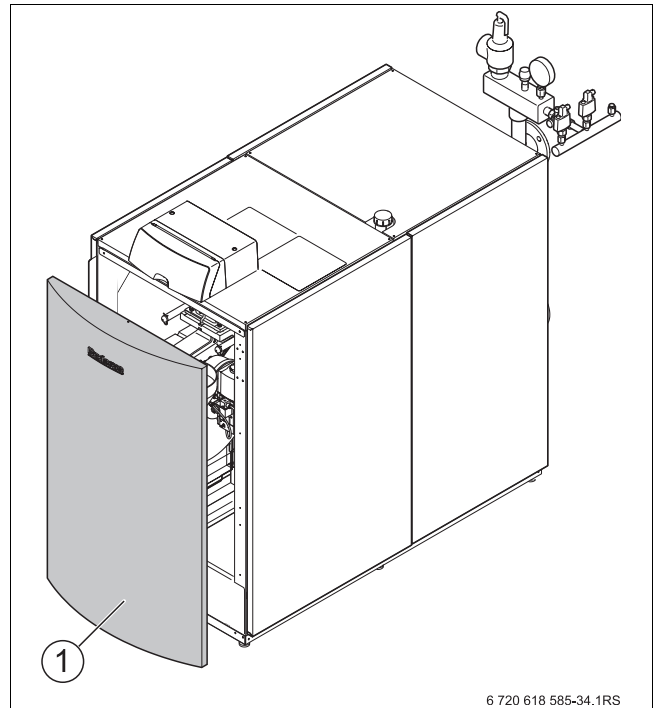
- ▶ Prior to opening the boiler: Disconnect the power across all poles and secure against unintentional reconnection.

- ▶ Shut down the heating system.
- ▶ Undo the locking screw from the top centre of the boiler front panel.
- ▶ Slightly lift the front panel and remove by pulling forwards.



**DANGER:** Risk to life from explosion of flammable gases!

- ▶ Only registered gas fitters are permitted to carry out work on gas lines (observe local regulations).



6 720 618 585-34.1RS

Fig. 39 Removing the front panel

1 Front

### 9.2 General work

The following work is not described in any further detail in this document. It must, nevertheless, still be carried out:

- ▶ Check the general condition of the heating system.
- ▶ Visual inspection and function check of the heating system.
- ▶ Check the balanced flue routing for function and safety.
- ▶ Check all gas and water pipes for signs of corrosion.
- ▶ Replace any corroded lines.
- ▶ Check the pre-charge pressure of the diaphragm expansion vessel.
- ▶ Check the concentration of any anti-freeze/additives that may be used in the system fill/top-up water annually.



## 9.3 Internal leak test

### 9.3.1 Determining the test volume

$$V_{\text{test}} = V_{\text{total}} = V_{\text{pipe}} + V_{\text{gas valve}}$$

- ▶ Determine length of pipe to main fuel shut-off valve.
- ▶ Determine the gas valve volume ( $V_{\text{gas valve}}$ ) using Tab. 12.
- ▶ Determine the pipework volume ( $V_{\text{pipe}}$ ) using Tab. 13 and Tab. 14.
- ▶ Calculate test volume ( $V_{\text{test}}$ ) according to above equation.

Gas valve volume (approximate values)	
Gas valve volumes up to 50 kW	0.1 litres
Gas valve volume > 50 kW	0.2 litres

Tab. 12 Gas valve volume ( $V_{\text{gas valve}}$ )

Pipe length in metres	Pipework volume ( $V_{\text{pipe}}$ ) in litres					
	Pipework diameter in inches					
	1/2	3/4	1	1 1/4	1 1/2	2
1	0.2	0.4	0.6	1.0	1.4	2.2
2	0.4	0.7	1.2	2.0	2.7	4.4
3	0.6	1.1	1.7	3.0	4.1	6.6
4	0.8	1.5	2.3	4.0	5.5	8.8
5	1.0	1.8	2.9	5.1	6.9	11.0
6	1.2	2.2	3.5	6.1	8.2	13.2
7	1.4	2.5	4.1	7.1	9.6	15.4
8	1.6	2.9	4.6	8.1	11.0	17.6
9	1.8	3.3	5.2	9.1	12.4	19.8
10	2.0	3.6	5.8	10.1	13.7	22.0

Tab. 13 Pipework volume ( $V_{\text{pipe}}$ ) subject to pipe length and diameter

Pipe length in metres	Pipework volume ( $V_{\text{pipe}}$ ) in litres					
	Pipe diameter in mm (copper pipe)					
	15 x 1	18 x 1	22 x 1	28 x 1.5	35 x 1.5	45 x 1.5
1	0.1	0.2	0.3	0.5	0.8	1.4
2	0.3	0.4	0.6	1.0	1.6	2.8
3	0.4	0.6	0.9	1.5	2.4	4.2
4	0.5	0.8	1.3	2.0	3.2	5.5
5	0.7	1.0	1.6	2.5	4.0	6.9
6	0.8	1.2	1.9	2.9	4.8	8.3
7	0.9	1.4	2.2	3.4	5.6	9.7
8	1.1	1.6	2.5	3.9	6.4	-
9	1.2	1.8	2.8	4.4	7.2	-
10	1.3	2.0	3.1	4.9	8.0	-

Tab. 14 Pipework volume ( $V_{\text{pipe}}$ ) subject to pipe length and diameter

### 9.3.2 Carrying out the leak test

- ▶ Close the main fuel shut-off valve.
- ▶ Undo threaded plug on test nipple by two turns.
- ▶ Push the test hose of the U-tube pressure gauge onto the test nipple.
- ▶ Open main fuel shut-off valve, read off pressure and note it down.
- ▶ Close main fuel shut-off valve and read off the pressure again after one minute.
- ▶ Calculate the pressure drop per minute through the differential.

Using the calculated pressure drop per minute and the test volume ( $V_{\text{test}}$ ), refer to the following diagram (→ Fig. 41) to see whether the gas valve can still be used.

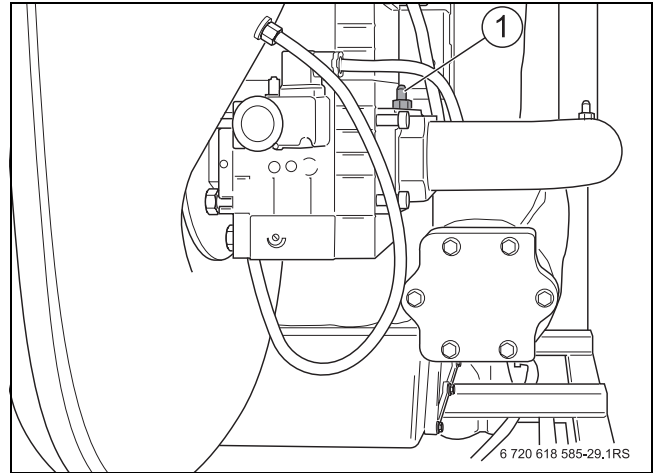


Fig. 40 Checking internally for tightness

1 Test nipple

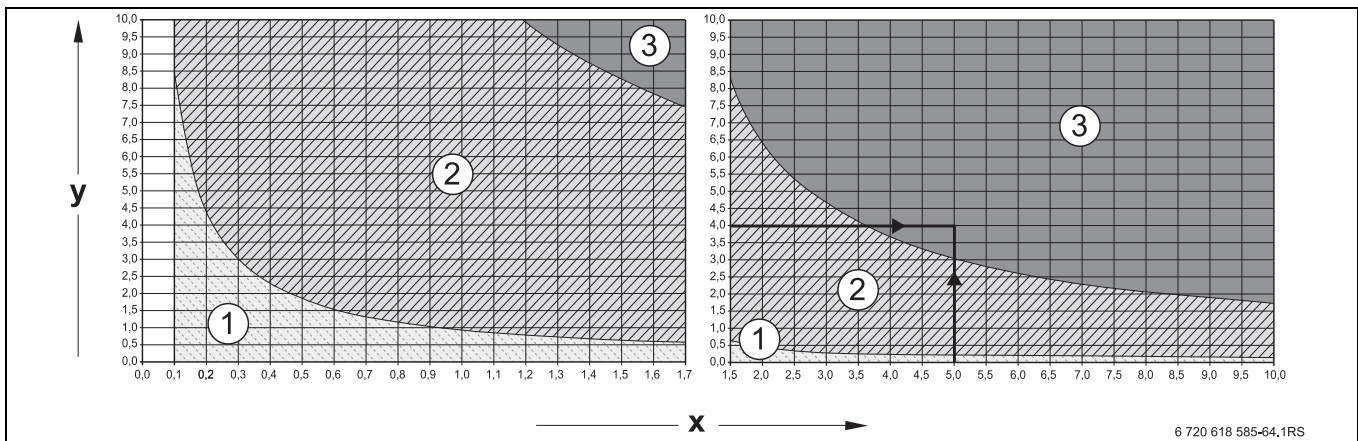


Fig. 41 Permissible pressure drop per minute for the internal leak test with gas pressure present

- x** Test volume in litres
- y** Test volume in mbar within one minute
- 1** Range "Valve tight" = applies to new installations
- 2** Range "Valve adequately tight" = valve can be used without restrictions
- 3** Range "Valve leaks" = valve may not be used >> check as described in the following

**Read-off example:** test volume ( $V_{\text{test}}$ ) 5 litres and pressure drop 4 mbar/min = range 3 "Valve leaks" = valve may not be used >> check as described in the following



If you detect a steep pressure drop of  $> 10$  mbar/minute at a test volume ( $V_{\text{test}}$ ) of  $< 1$ , increase the test volume ( $V_{\text{test}}$ ). For this, include the pipework to the next shut-off valve in the tightness test and repeat the test using the new test volume ( $V_{\text{test}}$ ).

If the read-off point for test volume ( $V_{\text{test}}$ ) and pressure drop per minute lies within the range "Valve leaks" (see read-off example), carry out the test described below.



#### CAUTION:

Risk of system damage due to short circuit.

- ▶ Never spray or let leak detection agent drip onto cable entries, plugs or electrical cables/leads.
- ▶ Cover areas at risk before testing for leaks.

- ▶ Check all sealed points in the tested pipework section using a foaming leak detection agent.
- ▶ If required, seal any leaks and repeat the test.
- ▶ If no leaks are found, replace gas valve.

#### Completing the leak test

- ▶ Remove hose.
- ▶ After completing the test, retighten the screw in the test nipple.
- ▶ Check the test nipple for leaks.

### 9.4 Checking the heating system operating pressure

**NOTICE:** System damage.  
If the heating system is filled when hot, the resulting temperature stresses can cause stress cracks. The boiler will then leak.

- ▶ Only fill the heating system when cold (the flow temperature should not exceed 40 °C).
- ▶ **When the heating system is in operation, never fill it via the boiler drain & fill valve. Instead, only use the filling valve in the heating system pipework (return).**
- ▶ Pay attention to the water quality as specified in the operator's log, and record the volume and quality of fill water used.

**NOTICE:** System damage due to frequent topping up.  
Depending on water quality, the heating system may be damaged by corrosion or limescale formation if you frequently need to top up the water (observe the operator's log).

- ▶ Vent the heating system during filling.
- ▶ Check the heating system for leaks.
- ▶ Check the function of the expansion vessel.

In sealed unvented systems the pressure gauge needle must be within the green band.

Ensure that the red pressure gauge needle is set to the required operating pressure.

**i** Create an operating pressure of at least 1 bar.

- ▶ Check the operating pressure of the heating system. The operating pressure is too low if the pressure gauge needle is below the green range. Top up with water.

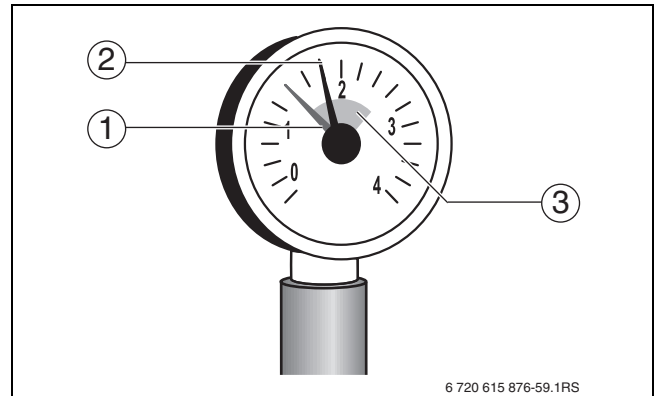


Fig. 42 Pressure gauge for sealed unvented systems

- 1 Red needle
- 2 Pressure gauge needle
- 3 Green band

**CAUTION:** Health risk from contaminated drinking water.

- ▶ Observe all regulations and standards applicable in your country regarding the prevention of drinking water contamination.

- ▶ Fill water via the on-site drain & fill valve.
- ▶ Vent the heating system via the radiator bleed valves.
- ▶ Check the operating pressure again.

**i** The operating pressure can also be checked at the control unit via the "Info menu" (e.g. display "P1.4" corresponds to 1.4 bar).

- ▶ Enter amount of top-up water in the operator's log.

### 9.5 Measuring carbon dioxide content

- ▶ Insert the test sensor through the test port in the flue pipe and hold it in the core gas flow.
- ▶ Record the flue gas values.  
If the CO<sub>2</sub> content differs by more than 0.5 % from its set value (→ Tab. 3, page 11), adjust the burner as described from Chapter 7.10 to 7.10.2.

## 9.6 Cleaning the burner and heat exchanger

Clean the boiler wet or dry.

Long and short cleaning blades are available as accessories for dry cleaning. Cleaning equipment is available as an accessory for wet cleaning.

- ▶ Shut down the heating system (→ Chapter 8).
- ▶ Close the main gas shut-off valve.
- ▶ Allow the boiler to cool down.
- ▶ Remove siphon [2] from the outlet of condensate tray [1] and position a bucket underneath the tray.

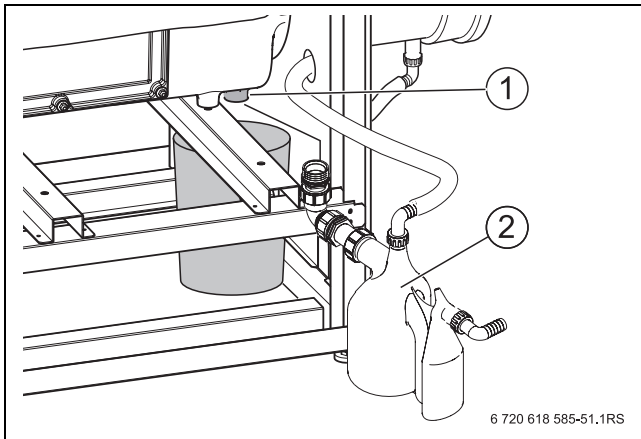


Fig. 43 Removing the siphon

- 1 Condensate tray outlet
- 2 Siphon

### 9.6.1 Removing and cleaning burner

- ▶ Undo toggle clip [1] at the top of the ventilation air hose.
- ▶ Pull off ventilation air hose [2] together with the connector from ventilation air collector [3].

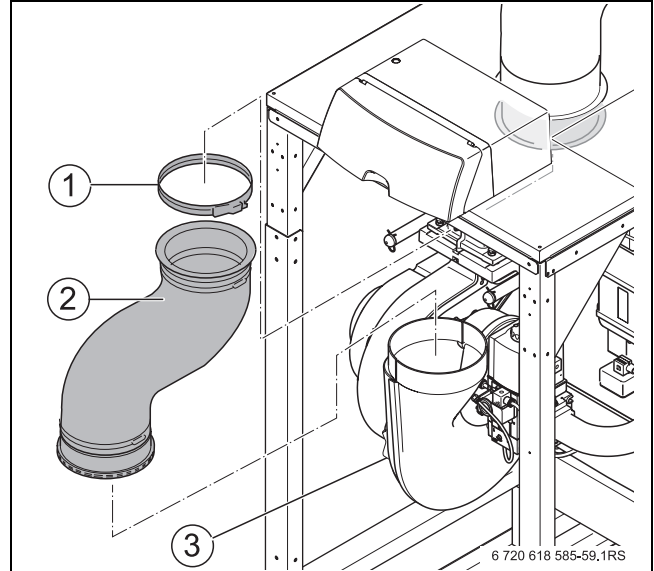


Fig. 44 Undoing the ventilation air hose

- 1 Toggle clip
- 2 Ventilation air hose
- 3 Ventilation air collector

- ▶ Undo the 4 screws from gas valve flange [1] and undo the gas connection.

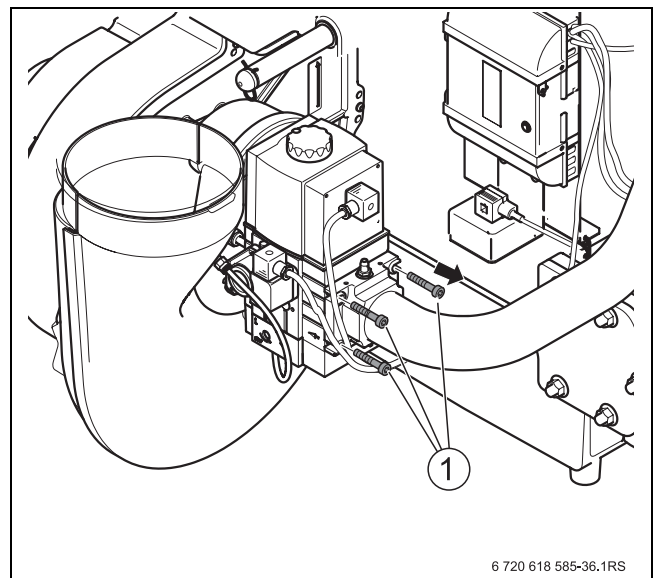


Fig. 45 Undoing the gas connection

- 1 Screws

- ▶ Undo all electrical plug-in connections at the electrode block.

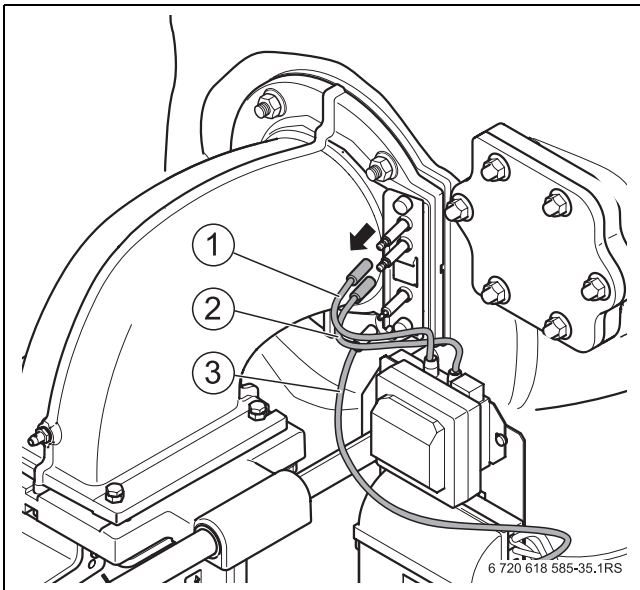


Fig. 46 Undoing the electrical plug-in connections at the electrode block

- 1 Monitoring cable
- 2 Ignition cable
- 3 Ignition cable

- ▶ Undo fixing nuts [1] at the top and bottom of the mixture manifold.
- ▶ Undo the electrical connections at the gas valve and the fan (→ Fig. 55, page 48).
- ▶ Carefully pull out the burner towards you.

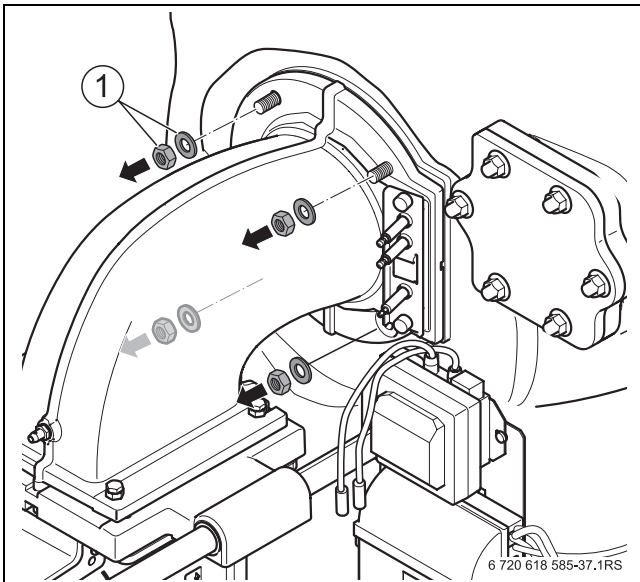


Fig. 47 Undoing the nuts at the mixture manifold

- 1 Fixing nuts with washer

- ▶ Undo all 4 screws [1] between the mixture manifold and the carriage.

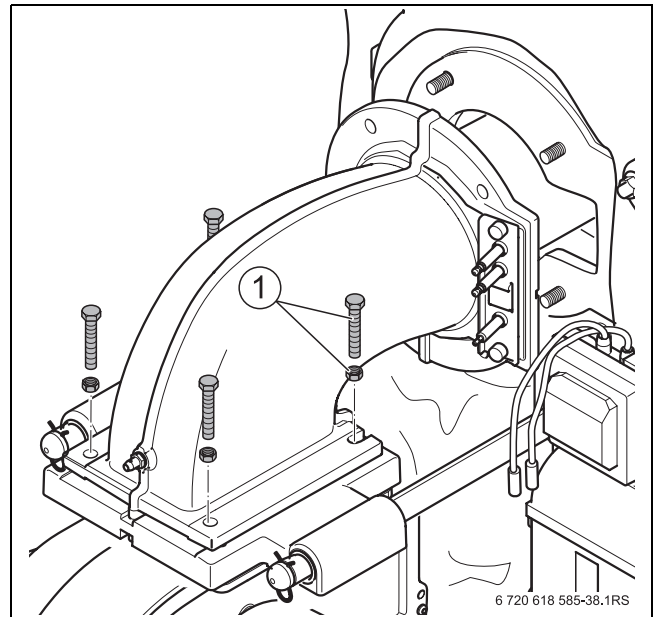


Fig. 48 Undoing the mixture manifold from the carriage

- 1 Screws and locknuts

- ▶ Pull out the burner together with the mixture manifold.

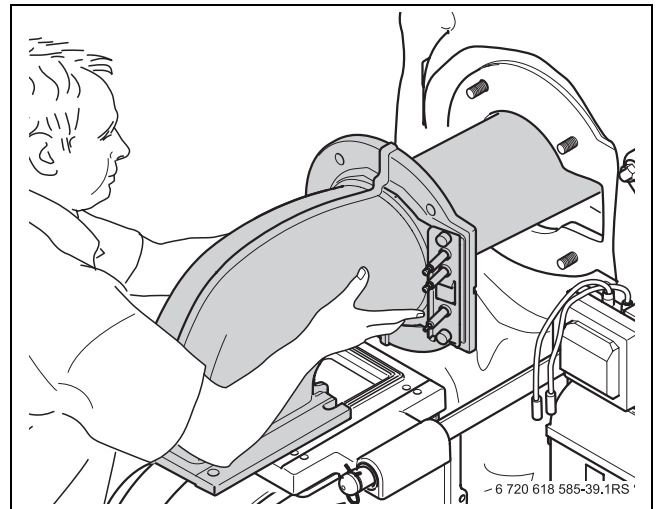


Fig. 49 Removing the burner

- ▶ Blow off the burner rods and mixture manifold from the inside and outside using compressed air.

## 9.6.2 Cleaning the heat exchanger

### Dry cleaning the heat exchanger

- ▶ Remove the thermal insulation from the heat exchanger.

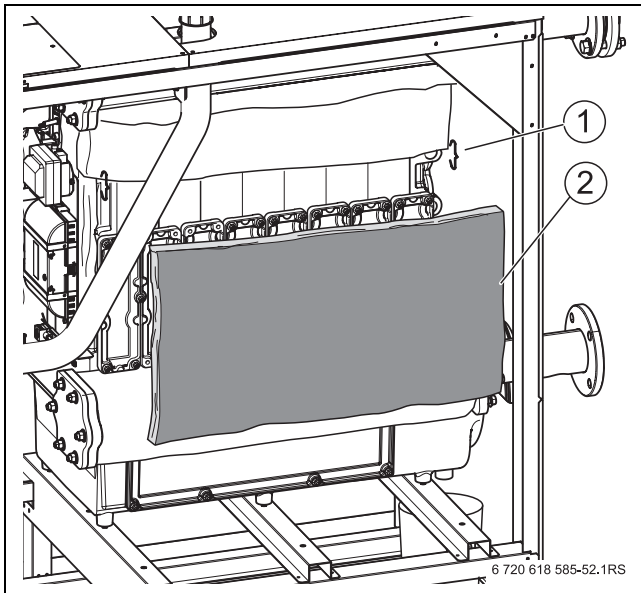


Fig. 50 Heat exchanger thermal insulation

- 1 Clip
- 2 Thermal insulation

- ▶ Undo fixing nuts from cleaning covers [1] at the top and bottom of the heat exchanger.
- ▶ Remove the cleaning covers.

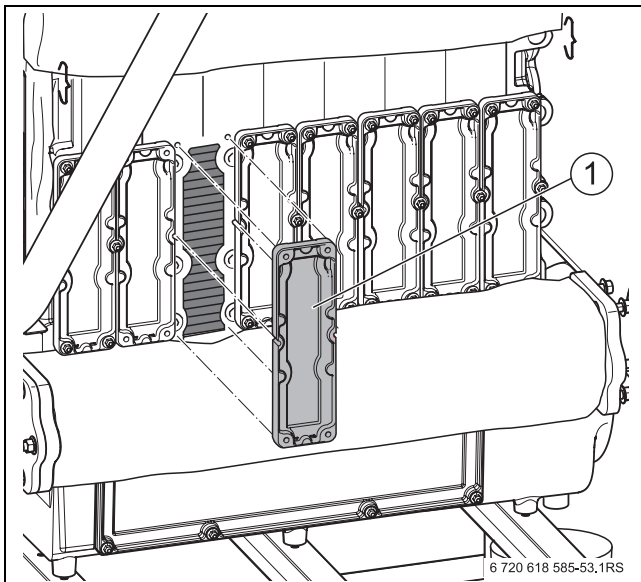


Fig. 51 Opening the cleaning covers

- 1 Cleaning cover

- ▶ Undo the fixing nuts from the top and bottom of the condensate tray cover.
- ▶ Remove the cover.



**CAUTION:** Risk of injury from sharp edges on the cleaning blades.

- ▶ To avoid injury, wear gloves when cleaning the boiler using cleaning blades (accessories).

- ▶ Clean the hot gas flues of the heat exchanger horizontally and diagonally using the long cleaning blade.
- ▶ Clean the back section of the hot gas flues from below through the condensate tray using the short cleaning blade.

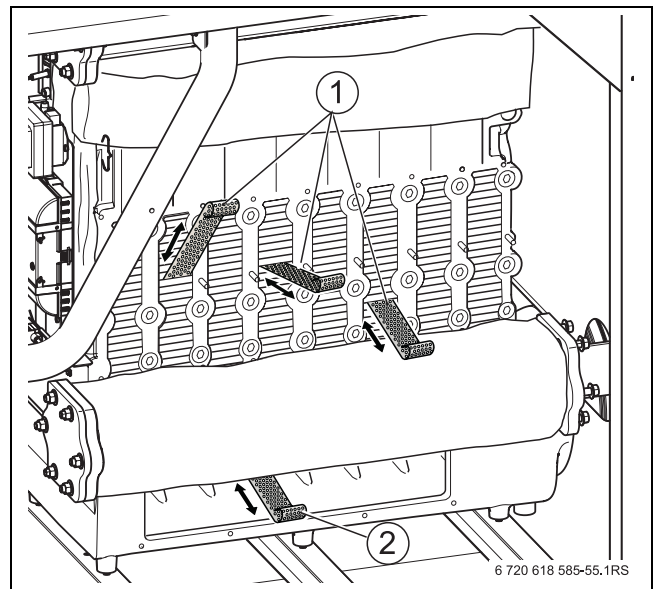


Fig. 52 Dry cleaning the heat exchanger

- 1 Long cleaning blade (available separately)
- 2 Short cleaning blade (available separately)



**WARNING:** Risk to life from escaping flue gas!

- ▶ During installation, look out for faulty gaskets and ensure they are seated correctly. Replace faulty gaskets.
- ▶ Replace the gaskets as described (→ Chapter 9.13).

- ▶ Screw the cleaning covers back on.

### Wet cleaning the heat exchanger

When wet cleaning, use a cleaning agent appropriate to the level of contamination (soot or encrusted residues). The cleaning agent must be suitable for aluminium.

- ▶ Clean the heat exchanger with water or a cleaning agent approved for aluminium (see instructions provided by the manufacturer of the cleaning agent).



During wet cleaning, protect electrical components (fan, gas valve etc.) against moisture and contamination.

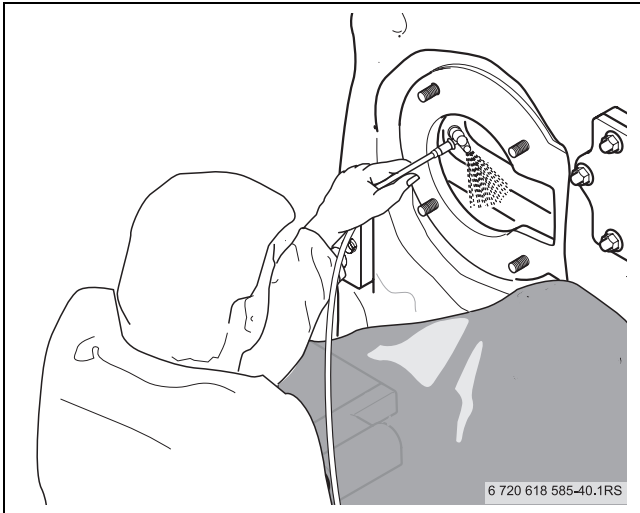


Fig. 53 Wet cleaning the heat exchanger

### Working on the heat exchanger during wet and dry cleaning

- ▶ Use a hose to flush any residues into the bucket or the condensate tray.
- ▶ Clean the condensate tray with water.
- ▶ Clean the siphon with water.



**WARNING:** Risk to life through poisoning! Siphons not filled with water can cause a risk to life through escaping flue gas.

- ▶ Fill the siphon with approx. 2 litres of water.

- ▶ Re-install the siphon (→ Chapter 6.2).
- ▶ Check the condensate hose between the boiler flue connection and the siphon for free flow.

## 9.7 Inspecting the burner electrodes

### Checking the electrode position

- ▶ Move the burner into its service position (→ Chapter 9.6).
- ▶ Check the gaps between the electrodes and compare them with those shown in Fig. 54.

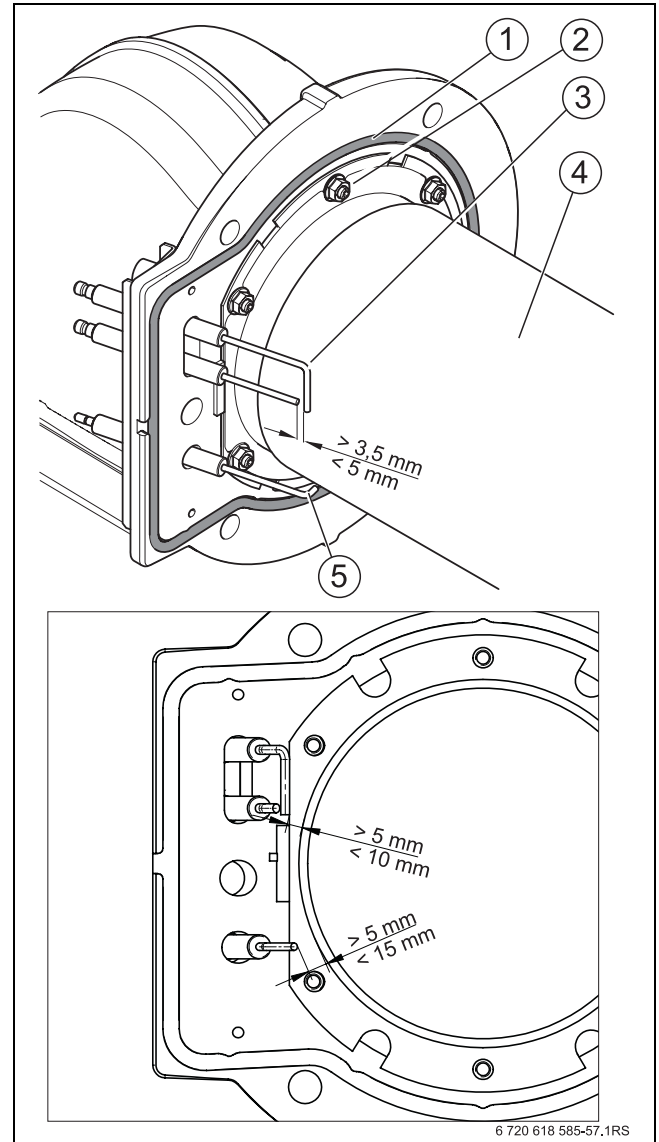


Fig. 54 Setting the electrode position

- 1 Gasket (O-ring), mixture manifold
- 2 Fixing screws, burner rod
- 3 Ignition electrode
- 4 Burner rod
- 5 Ionisation electrode

- ▶ Replace the electrode block together with a new gasket if actual values deviate from the specified parameters.
- ▶ Replace the electrode block together with a new gasket if deposits have formed on the electrodes.



We recommend the replacement of the electrode block as part of the annual service.

## 9.8 Replacing components

### 9.8.1 Removing the gas valve

- ▶ Shut down the heating system (→ Chapter 8).
- ▶ Close the main gas shut-off valve and secure against unintentional re-opening.
- ▶ Pull compensation hose [1] from the ventilation air collector.
- ▶ Undo the ventilation air hose between the ventilation air collector and adaptor at the hose clip.
- ▶ Remove the ventilation air hose together with the connector from the ventilation air collector.
- ▶ Undo cables [3] from the gas valve.
- ▶ Undo 4 screws [2] from the gas valve flange.

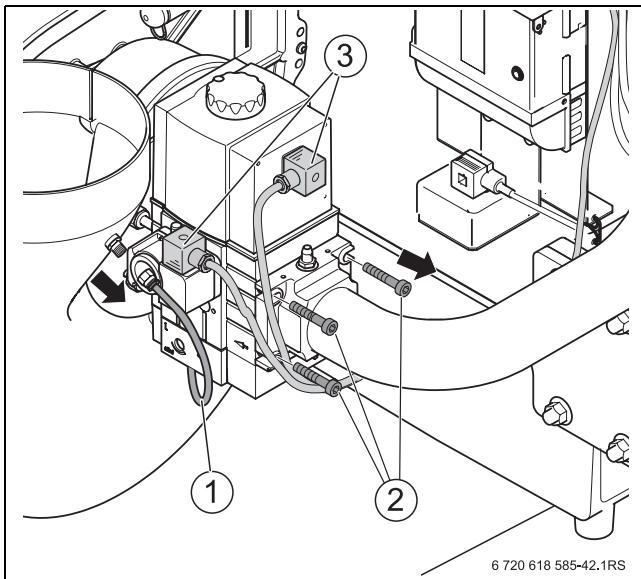


Fig. 55 Undoing the gas valve connections

- 1 Compensation hose
- 2 Screws
- 3 Cables

- ▶ Remove 3 nuts [2] from the nozzle plate and remove gas valve [1].

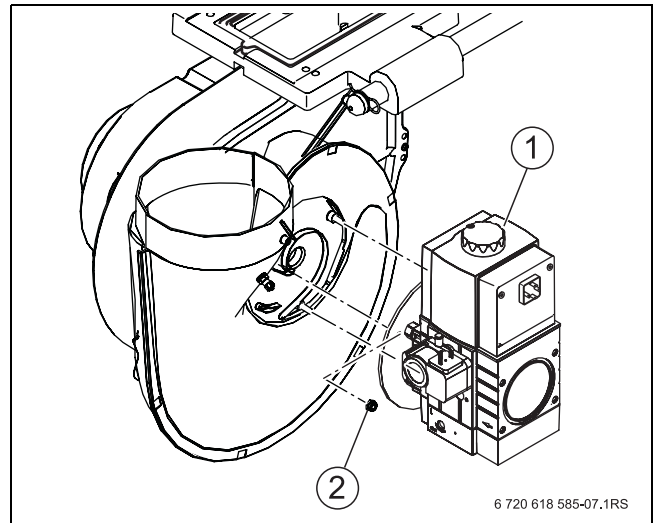


Fig. 56 Undoing the gas valve

- 1 Gas valve
- 2 Nut

### 9.8.2 Changing the gas filter

- ▶ Undo both screws [4] from filter cover [3] underneath the gas valve.
- ▶ Remove filter cassette [1] and insert a new one.
- ▶ Insert new gasket [2] at the filter cover and refit using both screws.

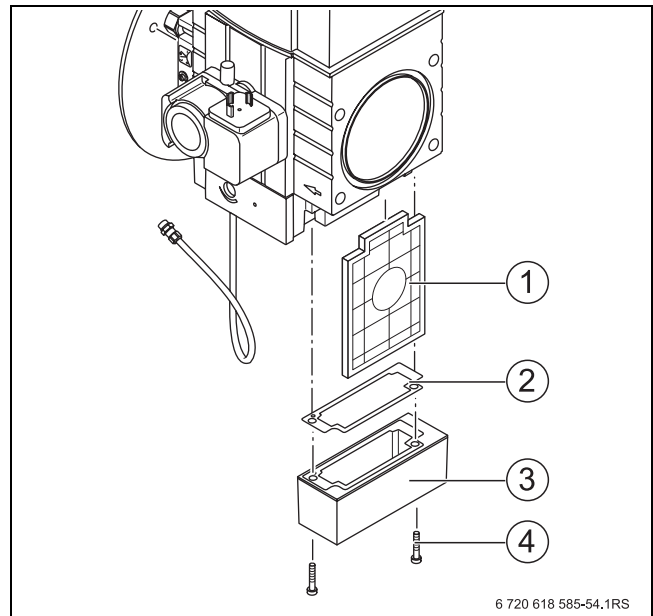


Fig. 57 Changing the gas filter

- 1 Filter cassette
- 2 Gasket
- 3 Filter cover
- 4 Screw



### 9.8.3 Removing the fan

- ▶ Undo the electric plug-in connections at the fan.
- ▶ Pull out the burner (→ Chapter 9.6.1).
- ▶ Remove the gas valve (→ Chapter 9.8.1).
- ▶ Undo clip [3] at the ventilation air collector and pull off front semi-shell [4] from its studs.
- ▶ Also remove impeller [2] and fan inlet nozzle [1] from the studs.

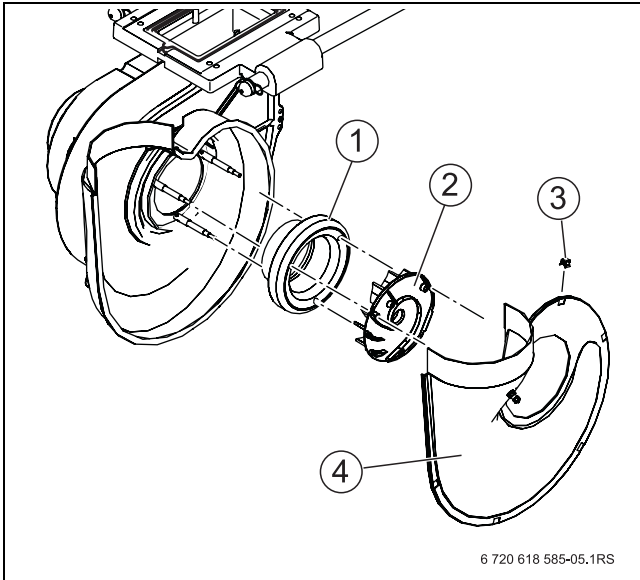


Fig. 58 Disassembling the components of the ventilation air collector

- 1 Fan inlet nozzle
- 2 Impeller
- 3 Clip
- 4 Front semi-shell

- ▶ Remove rear semi-shell [1].

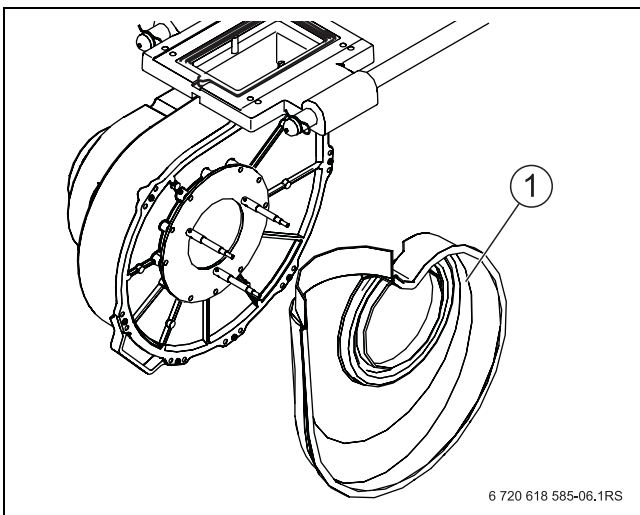


Fig. 59 Removing the rear semi-shell

- 1 Semi-shell

- ▶ Remove mounting plate [1] from the fan.
- ▶ Undo both rear screws [3] (joint between carriage [2] and fan [5] (do not remove).
- ▶ Support the fan and remove both front screws [4].
- ▶ Pull out the fan towards the front.

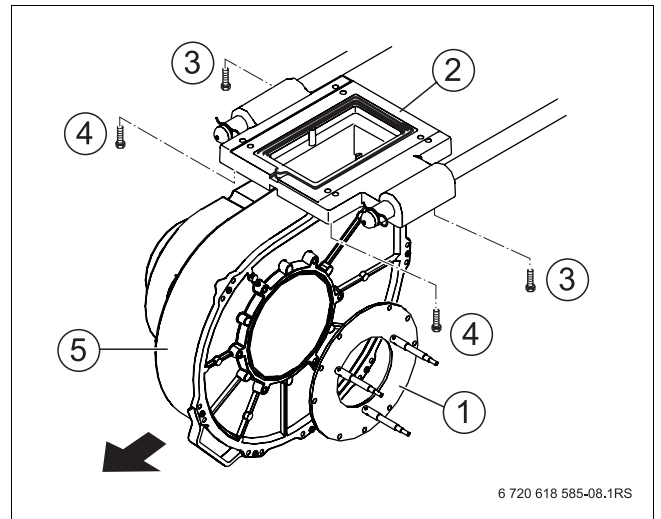


Fig. 60 Disassembling the components of the ventilation air collector

- 1 Mounting plate
- 2 Carriage
- 3 Rear screw
- 4 Front screw
- 5 Fan

### 9.9 Refitting detached parts

- ▶ Reassemble all boiler parts that were removed for inspection and maintenance purposes in the reverse order.
- ▶ Check all gaskets for wear and damage.



Observe the specified replacement interval for gaskets (→ Chapter 9.13).

- ▶ Replace gaskets if required.

### 9.9.1 Fitting the fan

- ▶ Push the fan underneath the screws undone on the underside of the carriage. Lower the fan slightly at the front and insert a new gasket [1] into the groove in the carriage.
- ▶ Secure the fan to the carriage using all 4 screws.

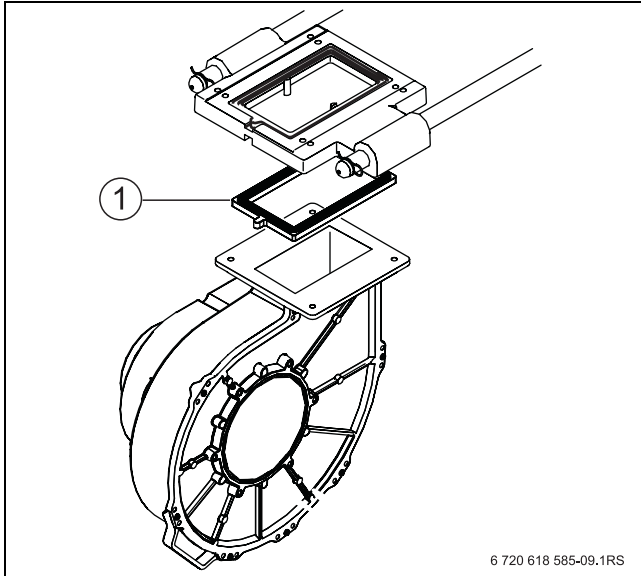


Fig. 61 Replacing the fan/carriage gaskets

- ▶ After the fan installation, check the gasket for correct seating.

### 9.9.2 Fitting the ventilation air collector and the gas valve

- ▶ Secure the mounting plate on the fan. Position the rear semi-shell of the ventilation air collector on the studs of the mounting plate and push the fan inlet nozzle over the studs towards the semi-shell, then secure it.
- ▶ Push the impeller onto the studs, so that the marking points upwards.



When fitting the impeller ensure that the marking points upwards.

- ▶ Secure the front semi-shell with clips to the ventilation air collector.
- ▶ Push the compensation hose onto the ventilation air collector.
- ▶ Secure the gas valve with the nozzle plate on the studs.

### 9.9.3 Installing the burner



**DANGER:** Risk to life from escaping flue gas!

- ▶ During installation, look out for faulty gaskets and ensure they are seated correctly. Replace faulty gaskets.
- ▶ Observe the order of assembly described.

- ▶ Insert the gasket on the top of the carriage.
- ▶ Insert the O-ring into the mixture manifold.
- ▶ Insert the burner together with the mixture manifold into the boiler combustion chamber.
- ▶ Push the carriage towards the boiler block.
- ▶ Secure the mixture manifold on the carriage using 4 screws.
- ▶ Secure the mixture manifold at the front section of the boiler using 4 nuts.



There is an indicator window on the top of the flange so you can check from the outside that a gasket has been inserted.

- ▶ Plug all necessary cables into the gas valve and fan, and the plug-in connections into the electrode block. During this step, route ionisation cable [1] as shown in Fig. 62 (below the guide rod).

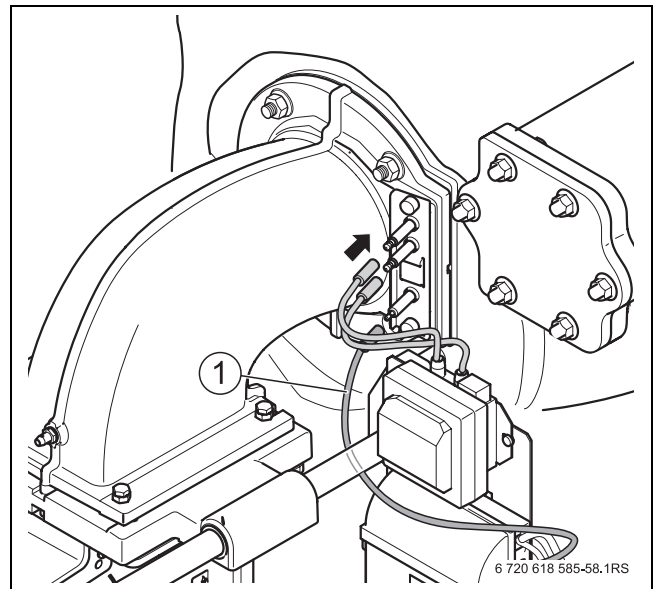



Fig. 62 Plug-in connection at the electrode block

### 9.9.4 Fitting the gas line to the gas valve

- ▶ Insert a new O-ring into the gas valve flange.
- ▶ Secure the gas valve to the fan using 4 screws.
- ▶ Secure the flange of the gas connection again to the gas valve using 4 screws.


### 9.9.5 Fitting the ventilation air unit

 **NOTICE:** System damage through contaminated air.

- ▶ Prior to fitting the ventilation air hose, check the ventilation air grille (integrated into the lower hose adaptor) for contamination and clean if required.

- ▶ Push on the ventilation air hose together with the connector onto the ventilation air collector and secure with a hose clip at the upper adaptor.

### 9.10 Checking for leaks during operation

 **NOTICE:** Risk of system damage due to short circuit.

- ▶ Cover the fan and other areas at risk prior to commencing the leak detection.
- ▶ Never spray the leak detection agent on cable entries, plugs or cables. Do not allow it to drip onto them either.

- ▶ Start the boiler and check all gaskets for leaks under full load using a leak detection agent.
- ▶ For further leak checks of the entire gas train, see Chapter 7.15, page 36.


### 9.11 Checking the ionisation current

To ensure trouble-free operation, the ionisation current at partial and full load (and burning flame) should be at least 3 µA.

The ionisation current (flame current) can be read off on the RC35 programming unit at "SERVICE MENU DIAGNOSIS/MONITOR VALUE" (→ Chapter 7.14.1).

## 9.12 Completing inspection and maintenance

### 9.12.1 Removing meters

 Observe the instructions for the BC10 and RC35.

### 9.12.2 Installing casing parts

- ▶ Fit the casing parts (→ Fig. 37, page 37).

### 9.12.3 Confirming inspection and service

- ▶ Sign the inspection and maintenance report in this manual (→ Chapter 9.14).


## 9.13 Replacing the gaskets subject to time in use

The following gaskets must be replaced after expiry of the specified time in use.


Gasket	Replacement after x years in use for type of use:	
	Standard <sup>1)</sup>	Industrial <sup>2)</sup>
Mixture manifold gasket (O-ring)	after 5 years	after 3 years
Cleaning cover gasket (on the heat exchanger)		

Tab. 15 Replacement according to time in use

- 1) Applicable to all conventional uses of the boiler as a gas condensing boiler for DHW and central heating.
- 2) Applicable to use of the boiler for industrial heat generation with constantly high flow temperatures and burner loads, for example.

 **WARNING:** Risk to life from escaping gases!

- ▶ Always replace the electrode block gasket when replacing electrodes.
- ▶ During every service, replace the gasket at the gas connection flange of the gas valve.
- ▶ Generally, replace damaged gaskets or ones that appear aged.

 We recommend the replacement of the electrode block as part of the annual service.

## 9.14 Inspection and maintenance reports

The inspection and maintenance reports are also designed as templates and may be photocopied.

► Sign and date the completed inspection work.

Inspection work		Page	Full load	Partial load	Full load	Partial load
1.	Check the general condition of the heating system (visual inspection and function check).			<input type="checkbox"/>		<input type="checkbox"/>
2.	Check system areas that are in contact with gas or water for the following:					
	- Internal leaks			<input type="checkbox"/>		<input type="checkbox"/>
	- Visible signs of corrosion			<input type="checkbox"/>		<input type="checkbox"/>
	- Signs of ageing			<input type="checkbox"/>		<input type="checkbox"/>
3.	The concentration of anti-freeze/additives in the heating water (observe manufacturer's instructions and the details in the operator's log).		Concentration: _____ %		Concentration: _____ %	
4.	Check the heating system water pressure.	43		<input type="checkbox"/>		<input type="checkbox"/>
	- Pre-charge of the expansion vessel (→ expansion vessel installation instructions).					
	- Operating pressure	43				
5.	Check the burner and heat exchanger for contamination; shut down the heating system for this step.					
6.	Check the siphon and the condensate tray; shut down the heating system for this step.					
7.	Check electrode block; shut down the heating system for this step.	47				
8.	Check the gas supply pressure.	33				
9.	Check the ventilation and extract air apertures, and the flue connection.	31		<input type="checkbox"/>		<input type="checkbox"/>
10.	Record actual values:	35				
	- Draught		_____ Pa	_____ Pa	_____ Pa	_____ Pa
	- Gross flue gas temperature $t_A$		_____ °C	_____ °C	_____ °C	_____ °C
	- Air temperature $t_L$		_____ °C	_____ °C	_____ °C	_____ °C
	- Net flue gas temperature $t_A - t_L$		_____ °C	_____ °C	_____ °C	_____ °C
	- Carbon dioxide content (CO <sub>2</sub> ) or oxygen content (O <sub>2</sub> )		_____ %	_____ %	_____ %	_____ %
	- CO value, free of air		_____ ppm	_____ ppm	_____ ppm	_____ ppm
11.	Carry out function checks:	36				
	- Check the ionisation current.		_____ μA	_____ μA	_____ μA	_____ μA
12.	Check for leaks during operation.	36		<input type="checkbox"/>		<input type="checkbox"/>
13.	Check that the control unit is set correctly for the prevailing conditions (see control unit documentation).	-		<input type="checkbox"/>		<input type="checkbox"/>
14.	Final checking of inspection work.	-		<input type="checkbox"/>		<input type="checkbox"/>
	Confirm professional inspection					
	Company stamp/date/signature					

Tab. 16



If any condition requiring maintenance is identified in the course of the inspection, that work must be carried out as required.



The specified replacement of gaskets is described in Chapter 9.13.

	Full load	Partial load	Full load	Partial load	Full load	Partial load	Full load	Partial load
1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.								
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	Concentration: _____ %		Concentration: _____ %		Concentration: _____ %		Concentration: _____ %	
4.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.								
6.								
7.								
8.								
9.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.								
	_____ Pa	_____ Pa	_____ Pa	_____ Pa	_____ Pa	_____ Pa	_____ Pa	_____ Pa
	_____ °C	_____ °C	_____ °C	_____ °C	_____ °C	_____ °C	_____ °C	_____ °C
	_____ °C	_____ °C	_____ °C	_____ °C	_____ °C	_____ °C	_____ °C	_____ °C
	_____ °C	_____ °C	_____ °C	_____ °C	_____ °C	_____ °C	_____ °C	_____ °C
	_____ %	_____ %	_____ %	_____ %	_____ %	_____ %	_____ %	_____ %
	_____ ppm	_____ ppm	_____ ppm	_____ ppm	_____ ppm	_____ ppm	_____ ppm	_____ ppm
11.								
	_____ μA	_____ μA	_____ μA	_____ μA	_____ μA	_____ μA	_____ μA	_____ μA
12.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Tab. 17

<b>Demand-dependent maintenance</b>		<b>Page</b>	<b>Date: _____</b>	<b>Date: _____</b>
1.	Shut down the heating system.	39	<input type="checkbox"/>	<input type="checkbox"/>
2.	Clean the burner and heat exchanger.	44	<input type="checkbox"/>	<input type="checkbox"/>
3.	Replace gaskets on the cleaning cover of the heat exchanger.	46	<input type="checkbox"/>	<input type="checkbox"/>
4.	Replace the electrode block.	47	<input type="checkbox"/>	<input type="checkbox"/>
5.	Clean the siphon.	47	<input type="checkbox"/>	<input type="checkbox"/>
6.	Clean the condensate tray.	47	<input type="checkbox"/>	<input type="checkbox"/>
7.	Replace the mixture manifold gasket (O-ring).	47	<input type="checkbox"/>	<input type="checkbox"/>
8.	Carry out a function check.		<input type="checkbox"/>	<input type="checkbox"/>
	Confirm professional service.			
	Company stamp/signature			

Tab. 18


	<b>Date: _____</b>	<b>Date: _____</b>	<b>Date: _____</b>	<b>Date: _____</b>	<b>Date: _____</b>
1.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Company stamp/ signature	Company stamp/ signature	Company stamp/ signature	Company stamp/ signature	Company stamp/ signature

Tab. 19

## 10 Troubleshooting

### 10.1 Recognising the operating state and resetting faults

If a fault has developed, the fault code flashes on the control unit display. The programming unit shows faults as plain text messages.



**CAUTION:** Risk of system damage through frost.

The heating system can freeze up if it has been switched off through a fault shutdown.

- ▶ Rectify the fault immediately and restart the heating system.
- ▶ Where that is not possible, drain the heating system and DHW pipework at the lowest point.

A fault has developed if the display flashes and indicates something other than the current boiler water temperature or an operating message.

Example: “6A” = the burner will not start

For an overview of the operating and fault codes, along with possible causes and remedial measures, see the control unit → documentation and the following Chapter 10.2.

- ▶ Hold down “Reset” for 5 seconds to clear the fault.

The reset is only possible if a fault message is flashing. The display shows “rE” whilst the reset is being implemented.

If the display then reverts to a standard operating message, the fault has been eliminated. Should the fault recur, repeat the reset two or three times.

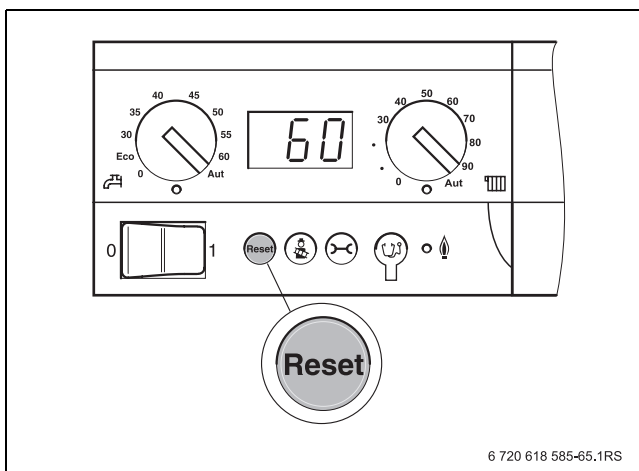


Fig. 63 Clearing a fault with the “Reset” button

## 10.2 Operating and fault displays

### 10.2.1 Operating messages

Display code	Supplementary code	Cause	Description	Test procedure/cause	Action
2P	564	Temperature rise at the boiler sensor too rapid (> 70 K/min).	Heat exchanger protection due to excessively fast heat-up speed.	No or insufficient heat consumption (e.g. thermostatic valves or mixers closed).	Ensure adequate heat consumption.
				Inadequate boiler flow rate.	Install adequately sized pumps.
				Pump does not work.	Check whether the pump is being switched. Replace the pump if required.
				Deposits on the water side of the boiler (dirt from the heating system, scaling).	Flush/clean the boiler block on the heating water side with agents approved for use with aluminium.
OA	-	Appliance in the switching optimisation routine.	A new burner demand occurs within the set switching optimisation time. Appliance in cycle block. The standard switching optimisation time is 10 min.	Check output setting at the BC10 base controller.	Match the boiler output to the required heat demand of the building.
				Check the control setting in the RC35 control unit.	Match the control setting to the system conditions.
OH	-	The appliance is in standby mode; there is no heat demand.	The boiler is ready to operate; there is no heat demand from the heating circuit.	-	-
OY	-	The current boiler water temperature is higher than the set boiler water temperature.	The current boiler water temperature is higher than the set boiler water temperature. The boiler shuts down.	-	-
OP	-	Waiting for the fan to ramp up.	The ramp-up needs to be detected for the sequence to be able to proceed.	-	-
OE	-	The appliance is in standby mode, there is an active heat demand, but an excess of energy is being supplied.	The current system heat demand is lower than that which the minimum modulation level of the burner supplies.	-	-
OU	-	Start of the program sequence to start the burner.	-	-	-
OC	-	Burner start begins.	-	-	-

Tab. 20 Operating codes



Display code	Supplementary code	Cause	Description	Test procedure/cause	Action
OL	-	Opening the gas valve.	-	-	-
OF	-	Insufficient boiler flow rate.	Temperature differential between the flow and return > 15 K.  Temperature differential between flow and safety temperature sensor > 15 K.	Check the flow temperature on the BC10, check the return temperature with RC35 or the service key, measure the resistance of the boiler sensor (high limit safety cut-out) and compare with the curve.	Adjust the setting of the boiler circuit pump.  Check the surface temperature of the cast section that is equipped with the safety temperature sensor using a thermometer.  Check whether a cast section is blocked with dirt.

Tab. 20 Operating codes

### 10.2.2 Fault displays

Type <sup>1)</sup>	Display code	Fault code	Cause	Description	Test procedure/cause	Action
B	2E	207	Water pressure < 0.6 bar.	-	Check whether the heating system pressure is at least 1 bar.	Correct the operating pressure.
V	2U	533	Incorrect hydraulic connection of boiler or pump.	The boiler control unit has recognised an incorrect flow on the water side.	Check that the boiler flow and return have not been swapped. Check pump for correct flow direction.	Connect flow and return correctly.  Ensure correct pump flow direction.
B	2U	565	Excessive differential between the flow and return temperature.  > 40 K	Heat exchanger protection due to excessive temperature spread.	Problems with the hydraulics.	Check the system hydraulics.
V	2U	575	Intelligent high limit safety cut-out, flow.	The actual boiler flow temperature reaches the intelligent high limit safety temperature for the flow of 140 °C, and a flame current is detected or the solenoid valves are open.	Check the flow rate on the water side.	Ensure adequate flow rate.  Replace boiler sensor/ high limit safety cut-out.  Replace ignition/ monitoring electrode.

Tab. 21 Fault displays

1) V = interlocking; B = blocking

Type <sup>1)</sup>	Display code	Fault code	Cause	Description	Test procedure/cause	Action
V	3C	537	No speed.	The SAFe receives no speed feedback, although the fan is supposed to be running.	Check cabling between the SAFe and the fan for contact separation, breaks and damage.  Check plug-in connection at the SAFe and the fan.	Make the contacts correctly. Replace cable if required.  If power is available (no an start), replace fan.
V	3C	538	Fan speed too low.	The detected speed is lower than the specified speed.	Fan contaminated.	Clean fan if required.
					Fan faulty.	Replace fan.
V	3C	540	Excessively high fan speed.	The detected speed is higher than the specified speed.	Check PWM signal/SAFe cabling for contact separation, breaks and damage.  Check plug-in connections for damage.	Make the contacts correctly. Replace cable if required.  Replace fan.
V	4A	520	Intelligent high limit safety cut-out, flow.	The flow temperature has reached a value of 100 °C.	The temperature rise is monitored by the boiler sensor. Consequently the burner is switched off in good time, making an occurrence of this fault message under normal circumstances unlikely.  Unfavourable hydraulics in two-boiler systems: boilers influence each other, e.g. via the return or flow.	Check hydraulics.

Tab. 21 Fault displays

1) V = interlocking; B = blocking

Type <sup>1)</sup>	Display code	Fault code	Cause	Description	Test procedure/cause	Action
V	4U	521	Excessive sensor differential at the boiler sensor between temperature sensors 1 and 2.	Excessive temperature differential between temperature sensors 1 and 2 (deviation > 5 K/2s).	Check that the "Reset" button illuminates on the SAFe.	Press "Reset" on the SAFe.
					Check that the check valve on the cylinder primary pump is closed.	Close the check valve if it is still open.
					Check whether the flow and return have been connected correctly.	If flow and return have been swapped, connect flow and return correctly.
					Check whether the plug-in connection on the boiler sensor and on the SAFe are contaminated or damaged.	If required, clean or replace the plug-in connections.
					Check the resistances at the boiler sensor according to table or visually inspect the plug at the temperature sensor.	Replace the boiler sensor if the sensor values deviate from the stated values, or if the plug is faulty.
					Check the voltage values on the boiler sensor according to table.	Replace the SAFe if there are deviations.
V	4U	522	Boiler sensor short circuit between temperature sensors 1 and 2.	A temperature sensor fault was detected in test mode.	Check the sensor lead.	Replace in case of damage.
					Check the plug-in connection.	Clean or replace if contaminated. Refit plug if it is found to be loose.
					Check sensor values according to table.	Replace the temperature sensor in case of deviations.
					Check the voltage at the temperature sensor according to table.	Replace the SAFe in case of deviations.

Tab. 21 Fault displays

1) V = interlocking; B = blocking

Type <sup>1)</sup>	Display code	Fault code	Cause	Description	Test procedure/cause	Action
V	4Y	523	Boiler temperature sensor break.	Temperature too low at the boiler temperature sensor (< -5 °C)	Check the sensor lead.	Replace in case of damage.
					Check the plug-in connection.	Clean or replace if contaminated. Replace in case of damage. Refit plug it is found to be loose.
					Check sensor values according to table.	Replace the temperature sensor in case of deviations.
					Check the voltage at the temperature sensor according to table (SAFe documentation).	Replace the SAFe in case of deviations.
V	4U	524	Boiler sensor short circuit.	The boiler sensor detected an excessively high temperature (> 130 °C).	Check the sensor lead.	Replace in case of damage.
					Check the plug-in connection.	Clean or replace if contaminated. Replace in case of damage. Refit plug it is found to be loose.
					Check sensor values according to table.	Replace the temperature sensor in case of deviations.
					Check the voltage at the temperature sensor according to table (SAFe documentation).	Replace the SAFe in case of deviations.
V	4A	575	Intelligent high limit safety cut-out responds.	The boiler flow temperature has reached its maximum permissible level.	The high limit safety cut-out has responded.	Check gas valve. (Does the flame extinguish after a control shutdown?)
B	5L	542	Incomplete communication with the SAFe.	The MC10 generates this fault if not all required data is supplied by the SAFe.	Check the cabling between the SAFe and the MC10.	Replace the SAFe if the connections are OK.

Tab. 21 Fault displays

1) V = interlocking; B = blocking

Type <sup>1)</sup>	Display code	Fault code	Cause	Description	Test procedure/cause	Action
B	5L	543	No communication with the SAFe.	The MC10 does not receive data from the SAFe.	Check whether the cable plugs (BUS cable and power cable) between SAFe and MC10 are correctly plugged in.	Refit plug if it is found to be loose.
					Check in the MC10 at terminals "Mains SAFe" whether 230 V are present.	Replace the MC10 if there are not 230 V.
					Check whether the cables (BUS cable and power cable) between the SAFe and the MC10 are damaged.	Replace cable.
					Check whether the green indicator illuminates on the SAFe.	Replace the SAFe if the indicator does not illuminate.
					Separate the BUS cable between SAFe and MC10 and check whether the boiler enters emergency mode (runs at 60 °C boiler water temperature).	Replace the SAFe if the boiler does not start.
					Make replacements to check whether it is the SAFe or the MC10 that is faulty.	Replace the SAFe or MC10.
					If the SAFe remains dark, wait a short time as the appliance will not start up if the SAFe is cold.	Wait up to 30 minutes and check whether the green indicator on the SAFe illuminates again. Replace the SAFe if that is not the case.
B	6L	515	Ionisation signal failure during operation.	Ionisation signal failure during burner operation.	-	None; the SAFe will try a restart.
B	6L	514	Flame torn off within the flame stabilisation time.	No flame signal was detected within the stabilisation time.	-	None; the SAFe will try a restart.
V	6C	576	Ionisation current within the pre-purge time > 0.9 µA.	A flame signal was detected during the pre-purge time.	Check the ionisation electrode. Ensure that the metal fibres of the burner gauze have no contact with the electrodes. Check gas valve function.	Check electrode gap on the ionisation electrode. Replace ionisation electrode. Replace gas valve.

Tab. 21 Fault displays

1) V = interlocking; B = blocking

Type <sup>1)</sup>	Display code	Fault code	Cause	Description	Test procedure/cause	Action
B	6A	577	No flame within the safety time.	Ionisation current within the safety time < 1.1 µA.	Gas supply pressure too low.	Notify gas supply utility if the supply pressure is too low.
					The gas governor is not adjusted to the required gas volume.	Install gas governor that is adjusted to the required gas volume or, if necessary, notify gas supply utility.
					Inadequately sized gas line cross-sections (min. cross-section of the gas supply pipe).	Install adequately sized gas lines.
					Air in the gas line.	Vent the gas line.
					Excessively high flue system backpressure through unfavourable layout (too many diversions; cross-section inadequate or too long; horizontal sections too long).	Size and route the flue system correctly.
					Ignition/ionisation electrode contaminated.	Clean or replace ignition/ionisation electrode.
					Check cabling between the SAFe and the ionisation electrode for contact separation, breaks and damage.	Make the contacts correctly. Replace cable if required.
					Check electrode gaps and ignition/ionisation electrode for damage.	Align burner rod or electrode. Replace faulty electrode.
					Check cabling between the ignition transformer and ignition electrode for contact separation (on electrode and transformer), breaks and damage.	Make the contacts correctly. Replace cable if required.
					SAFe burner control unit faulty.	Replace the SAFe.
					Ignition transformer faulty (no or delayed ignition spark, "hard start").	Replace the ignition transformer.
V	6L	561	"Power up" 5 times (power interruption during burner start).	The burner control unit was switched off 5 times during the burner start.	Check the 230 V power supply to the control unit.	Reset burner control unit.  Remedy problem with the power supply.

Tab. 21 Fault displays

1) V = interlocking; B = blocking

Type <sup>1)</sup>	Display code	Fault code	Cause	Description	Test procedure/cause	Action
B	7A	550	Undervoltage.	The mains voltage is too low.	The power supply must not fall below 195 V.	Ensure the correct power supply.
B	7A	551	Voltage interruption.	There has been a brief power failure.	Check the power cable for possible loose contacts.  Check the wiring and correct contacts of the mains plug at the MC10 or SAFe.	Remedy any contact problems.
B	7P	549	The safety chain has opened.	The continuity of the external components tied into the MC10 safety chain has been interrupted.	Check the continuity of the components.	If required, replace faulty components.
B	8L	534	No gas pressure or additional flue gas pressure limiter (pressure > 7.5 bar) has responded.	There is no gas pressure although solenoid valve 1 should have opened. The burner makes three successive attempts at starting, then there is a delay of one hour, before making three more start attempts.	Check that the gas tap is open.	Replace the gas valve if required.
					Check whether there is gas pressure.	Check the gas pressure.
					Check whether the flue gas pressure limiter has responded.	Reset the flue gas pressure limiter. Check the flue for blockages.
					Check electrode.	Replace electrode if required.
					Check ignition transformer.	Replace ignition transformer if required.
					Check gas filter for contamination.	Replace gas filter if required.
V	8P	580	Solenoid valve 1 leaking.	The valve test system has detected an unacceptably high leakage rate on solenoid valve 1.	Check gas valve for contamination.  Gas filter fitted.	Replace gas valve.
V	8U	581	Solenoid valve 2 leaking.	The valve test system has detected an unacceptably high leakage rate on solenoid valve 2.	Check gas valve for contamination.  Gas filter fitted.	Replace gas valve.

Tab. 21 Fault displays

1) V = interlocking; B = blocking

Type <sup>1)</sup>	Display code	Fault code	Cause	Description	Test procedure/cause	Action
V	9Y	500 501 502 503	Internal SAFe relay faulty.	Internal SAFe electronics faulty.	Press "Reset" and wait to see if the fault has been removed.	Replace the SAFe if the fault persists after "Reset" has been pressed.
V	CY	566	Return temperature < -5 °C (interruption).	The control unit receives unrealistic values from the return sensor.	Check cabling between SAFe and return sensor.	Replace cable if required.
					Check electrical connection of the SAFe cable.	Remedy contact problem if required. Replace temperature sensor if required.
V	CY	567	Return temperature > 130 °C (short circuit).	The control unit receives unrealistic values from the return sensor.	Check resistance values of temperature sensor according to table.	Replace SAFe if resistance values of the temperature sensor are correct, but voltage values are incorrect.
					Check voltage at the temperature sensor terminals inside the SAFe according to table.	Replace SAFe if resistance values of the temperature sensor are correct, but voltage values are incorrect.
V	CY	567	Return temperature > 130 °C (short circuit).	The control unit receives unrealistic values from the return sensor.	Check cabling between SAFe and return sensor.	Replace cable if required.
					Check electrical connection of the SAFe cable.	Remedy contact problem if required.
					Check resistance values of temperature sensor according to table.	Replace temperature sensor if required.
					Check voltage at the temperature sensor terminals inside the SAFe according to table.	Replace SAFe if resistance values of the temperature sensor are correct, but voltage values are incorrect.
V	CO	568	Water pressure sensor fault (cable break).	Water pressure sensor interruption (voltage > 3.5 V).	Check lead to water pressure sensor. Check water pressure sensor.	Remedy any interruption. Replace water pressure sensor.
V	CO	569	Water pressure sensor fault (short circuit).	Water pressure sensor short circuit (voltage < 0.5 V).	Check lead to water pressure sensor. Check water pressure sensor.	Remedy any short circuit. Replace water pressure sensor.

Tab. 21 Fault displays

1) V = interlocking; B = blocking



Type <sup>1)</sup>	Display code	Fault code	Cause	Description	Test procedure/cause	Action
V	CY	573	Flow temperature < -5 °C (interruption).	The control unit receives unrealistic values from the flow temperature sensor.	Check cabling between SAFe and flow temperature sensor.	Replace cable if required.
					Check electrical connection of the SAFe cable.	Remedy contact problem if required.
					Check resistance values of temperature sensor according to table.	Replace temperature sensor if required.
					Check voltage at the temperature sensor terminals inside the SAFe according to table.	Replace SAFe if resistance values of the temperature sensor are correct, but voltage values are incorrect.
V	CY	574	Flow temperature > 130 °C (short circuit).	The control unit receives unrealistic values from the flow temperature sensor.	Check cabling between SAFe and flow temperature sensor.	Replace cable if required.
					Check electrical connection of the SAFe cable.	Remedy contact problem if required.
					Check resistance values of temperature sensor according to table.	Replace temperature sensor if required.
					Check voltage at the temperature sensor terminals inside the SAFe according to table.	Replace SAFe if resistance values of the temperature sensor are correct, but voltage values are incorrect.
V	LP	570	Too many resets via the interface.	Too many resets were carried out via the interface within a certain period.  Please note: this fault can only be reset via the button on the SAFe.	Faults have been repeatedly reset but not removed.	Identify the cause for the faults that have resulted in the resets and remove them.
					The BC10 has developed a fault causing constant resets.	Replace the BC10.
					The SAFe has developed a fault.	Replace the SAFe.

Tab. 21 Fault displays

1) V = interlocking; B = blocking

Type <sup>1)</sup>	Display code	Fault code	Cause	Description	Test procedure/cause	Action
V	LL	571	Too many restarts despite resets.	15 restarts occurred in direct succession. This means that the same problem persisted after the resets.  Please note: this fault can only be reset via the button on the SAFe.	Faults have been repeatedly reset but not removed.	Identify the cause for the faults that have resulted in the resets and remove them.
V	EE	601	Flow temperature sensor measurement.	Successive measurements of the flow temperature deviate severely from each other.	Check the boiler sensor lead.	Replace in case of damage.  Clean or replace if contaminated.
					Check the plug-in connection.	Refit plug it is found to be loose.
					Check sensor values according to table.	Replace the temperature sensor in case of deviations.
					Check the voltage at the temperature sensor according to table.	Replace the SAFe in case of deviations.
V	EE	612	Return temperature sensor measurement.	Successive measurements of the return temperature deviate severely from each other.	Check the boiler sensor lead.	Replace in case of damage.  Clean or replace if contaminated.
					Check the plug-in connection.	Refit plug it is found to be loose.
					Check sensor values according to table.	Replace the temperature sensor in case of deviations.
					Check the voltage at the temperature sensor according to table.	Replace the SAFe in case of deviations.
V	EE	613	Flow temperature sensor measurement.	Successive measurements of the flow temperature deviate severely from each other.	Check resistance value of the flow temperature sensor.	Replace flow temperature sensor in case of deviations.

Tab. 21 Fault displays

1) V = interlocking; B = blocking

# 11 Appendix

## 11.1 Sensor curves



**DANGER:** Risk to life from electric shock.  
 ▶ Isolate the heating system before taking any readings.

Always measure the temperatures being compared (room, flow, outside and flue gas temperatures) near the relevant sensor. The curves depict mean values and are subject to tolerances. Measure the resistance at the cable ends.

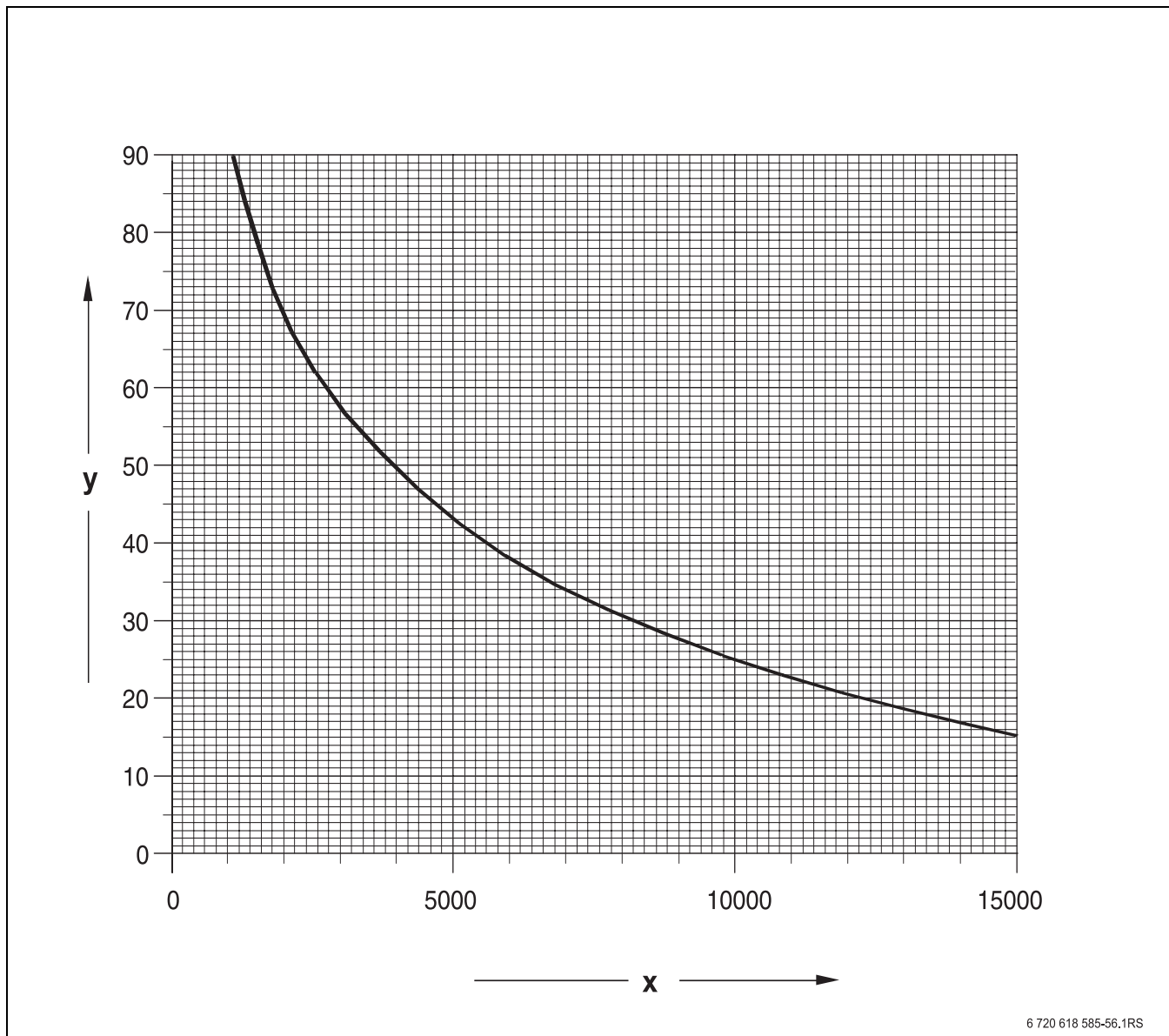


Fig. 64 Sensor curves: boiler sensor

**x** Resistance in Ω  
**y** Temperature in °C



Two identical sensors (dual sensors) installed in one sensor casing are used as boiler sensors.



All temperature sensors on the GB402 have the same sensor curve.

## 11.2 Hydraulic resistance

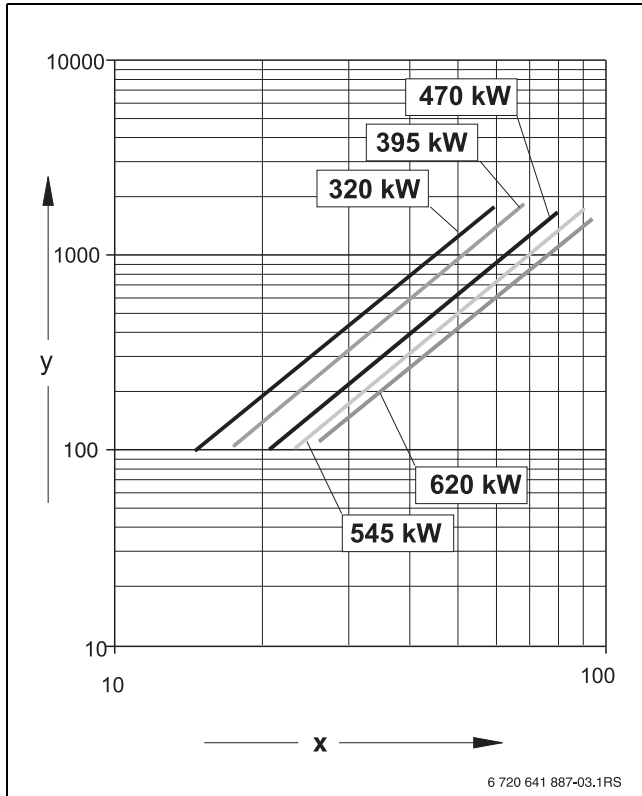


Fig. 65 Flow pressure drop on the heating water side

- x** Flow rate ( m<sup>3</sup>/h)  
**y** Pressure drop on the heating water side (mbar)

## 11.3 MC10 connection diagram



**NOTICE:** System damage through incorrect installation.

- ▶ Provide a permanent (hard-wired) power supply (no plug-in connection).
- ▶ Ensure the power is connected to the correct phases.
- ▶ Implement the installation, fuse protection, mains isolator, emergency stop switch and protective measures in accordance with local regulations.



**DANGER:** Risk to life from electric shock!

- ▶ Never use the earth conductor (yellow/green) as control line.



**NOTICE:** Operating faults through power failure.

- ▶ When connecting external components to the MC10 control unit, ensure that the total power consumption of these components does not exceed 5 A.

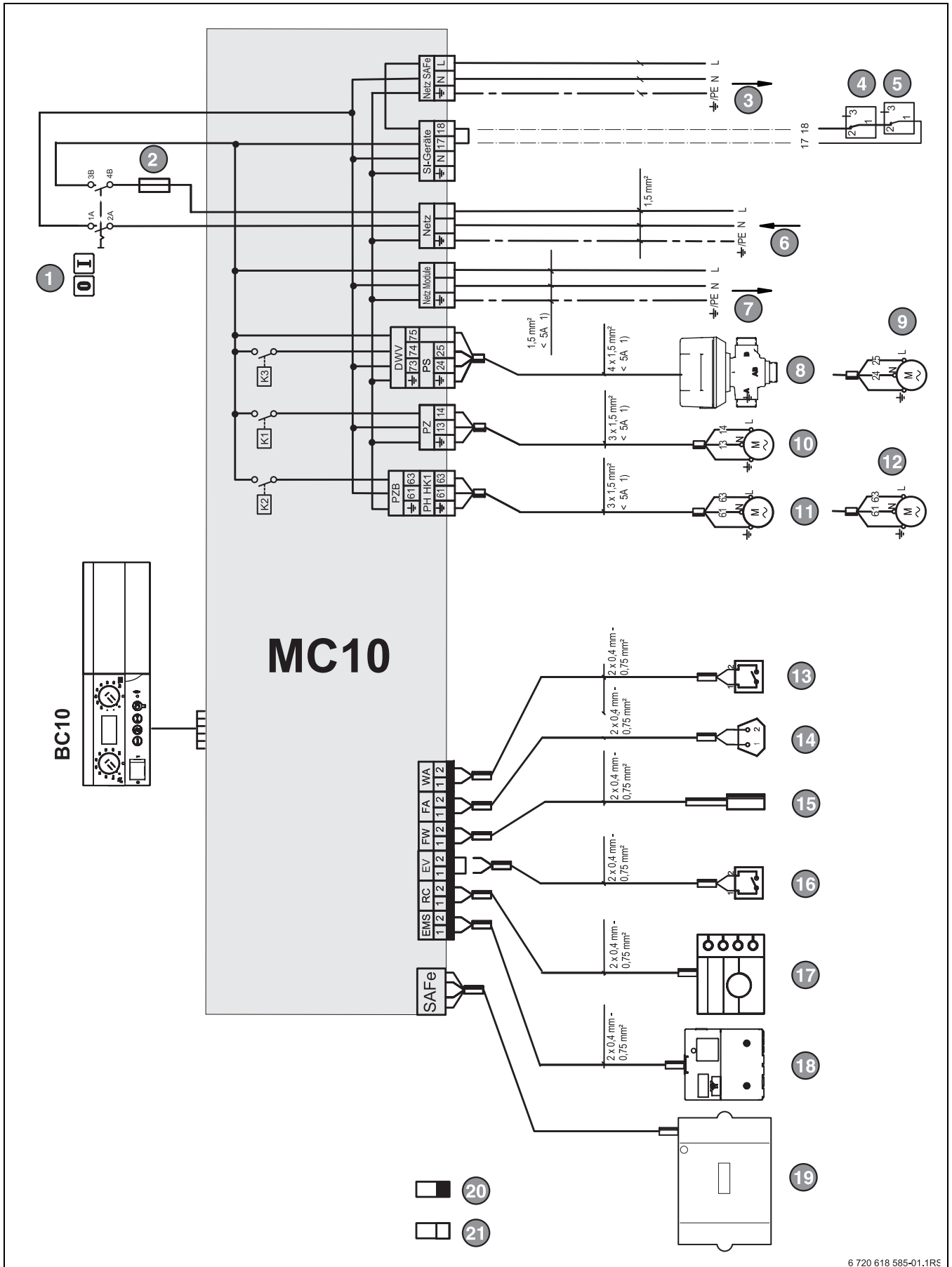


Fig. 66 MC10 connection diagram

1) The total current of all externally connected components must not exceed 5 A.

**Key to Fig. 66:**

- 1 ON/OFF switch
- 2 Fuse, 10 AF
- 3 Power supply to SAFe burner control unit, 230 V/50 Hz
- 4 Component 1
- 5 Component 2
- 6 Mains entry
- 7 Power supply for function modules, 230 V/50 Hz
- 8 DWV 3-way valve  
Terminal 73 blue  
Terminal 74 black  
Terminal 75 brown
- 9 PS - Cylinder primary pump
- 10 PZ - DHW circulation pump
- 11 PZB - Feed pump
- 12 PH-HK1 - Heating circuit pump
- 13 WA - Heat demand (external)
- 14 FA - Outside temperature sensor
- 15 FW - DHW temperature sensor
- 16 EV - external interlock(remove jumper during connection)
- 17 RC - Room controller
- 18 EMS - BUS cable EMS, connection to function modules
- 19 SAFe - BUS cable SAFe, connection to the burner control unit
- 20 Low voltages
- 21 Control voltage 230 V~

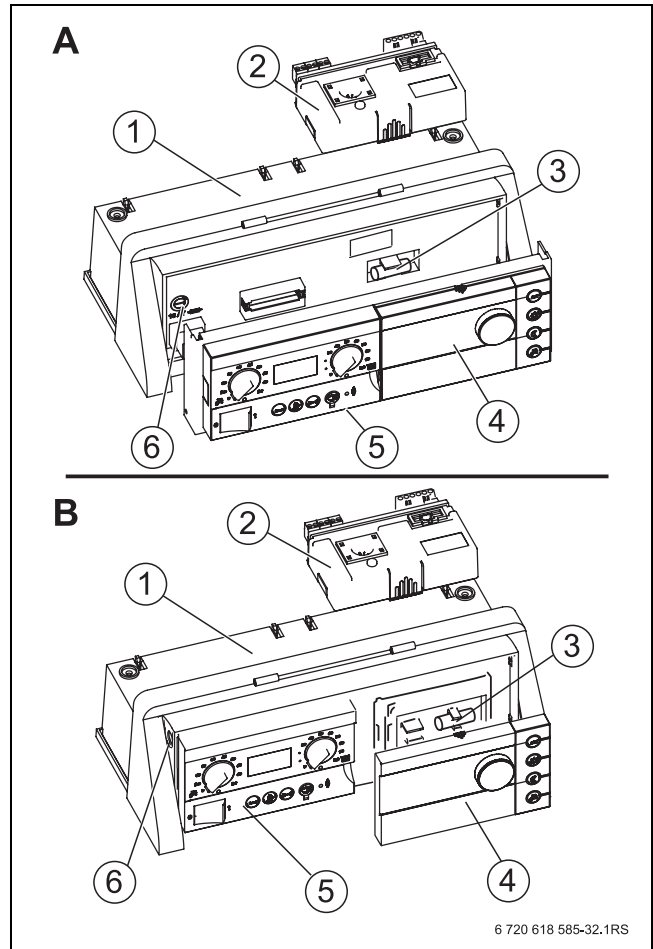


Fig. 67 Available versions BC10

- A** Fuse inside the MC10
- B** Fuse inside the BC10 base controller
- 1 Logamatic MC10
- 2 Function modules xM10
- 3 Spare fuse 10 AF
- 4 RC35 programming unit or dummy cover
- 5 BC10 base controller
- 6 Appliance fuse 10 AF

### 11.4 SAFe connection diagram

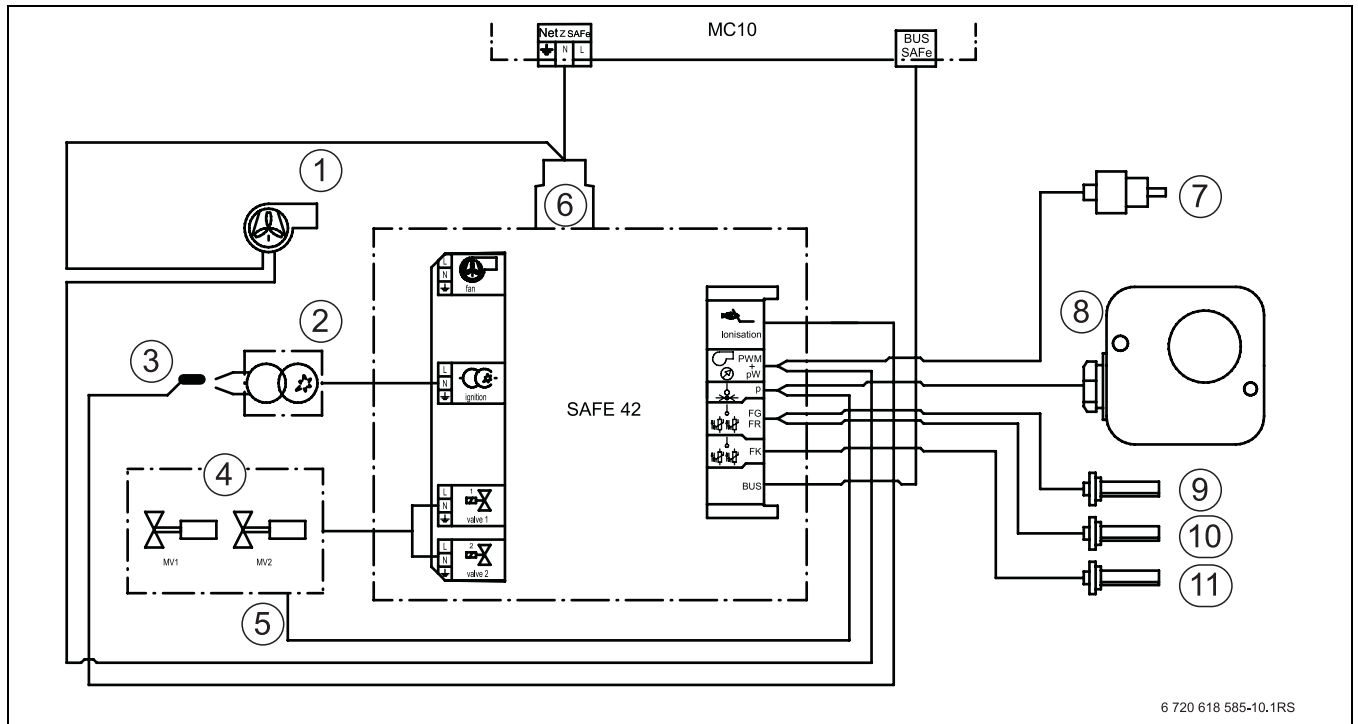


Fig. 68 SAFe connection diagram

- 1 Fan (PWM signal)
- 2 Ignition transformer
- 3 Ionisation
- 4 Gas solenoid valve (MV1/MV2)
- 5 Gas pressure switch
- 6 Mains entry
- 7 Water pressure sensor
- 8 Flue gas pressure limiter
- 9 Flow temperature sensor
- 10 Return sensor
- 11 Boiler sensor

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## Notes



## Notes



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In the UK and IE, Buderus is a brand name of  
Bosch Thermotechnology Ltd.

**Buderus**